Chapter 6

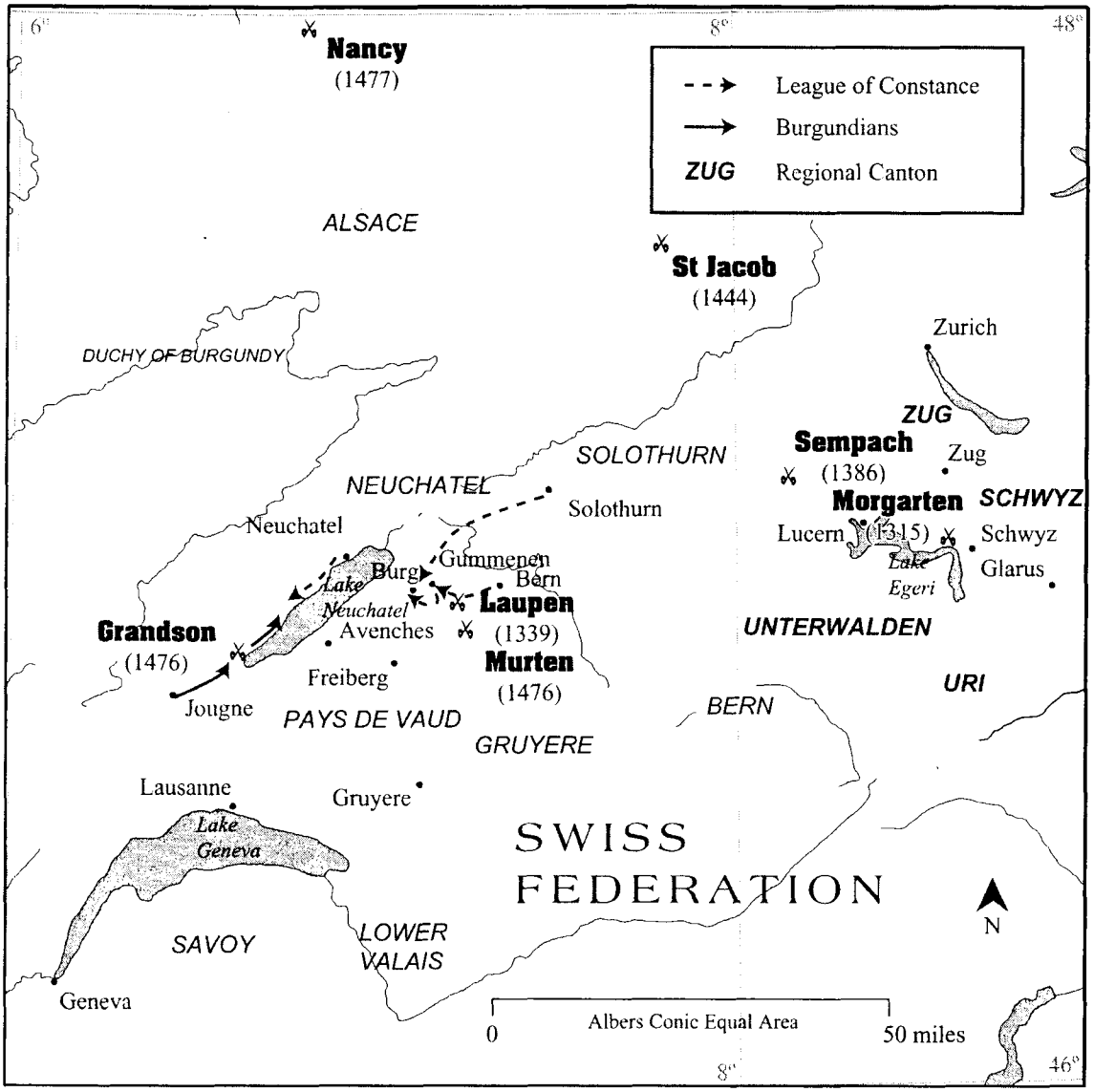
Late Medieval Warfare: The Return of Heavy Infantry

The Rise of the Swiss Battle Square

Although medieval commanders had long known the importance of foot soldiers as the backbone of their defensive formations, the return of heavy infantry capable of well-articulated offensive action began with the Swiss, who rediscovered this weapon system in their struggle with the Austrian Habsburgs and the duchy of Burgundy. As early as the beginning of the fourteenth century, the Swiss had developed heavy infantry who fought in a battle square that rivalled the best from the classical period and profoundly affected the development of European warfare in the late Middle Ages and beyond.[1]

Fighting on foot came naturally to the poor Swiss mountaineers, suiting both the rugged terrain of their homeland and their limited resources. Isolated from the feudal mainstream of western Europe by the Alps and organized into small rural valley communities, the Swiss subscribed to the old Germanic tradition whereby all able-bodied men were expected to participate in their *Waldstaaten* or forest canton militia (Map 6.1).[2] Also in the old Germanic tradition, Swiss cantonal societies were organized around clans, with clan leaders and aldermen serving on local councils that ruled through laws of their own making. Consequently, Swiss society was more democratic, less rigid and more unstructured than medieval societies elsewhere.[3] But as the Middle Ages waned, the democratic ideals of the poor, rural forest cantons came under attack by the periodic encroachments of the neighbouring Habsburgs of Austria and Burgundian lords who wanted to impose their own feudal structures on the Swiss cantons.[4]

Forced to take up arms to maintain their self-determination, the Swiss developed a militia-based tactical system shaped by their own social and economic realities. Like classical Greek citizen militia of two millennia before, the Swiss adopted the battle square or phalanx, based on a simple, distinctive heavy infantry doctrine and drilled themselves in its application. Before the late medieval period, these cantonal armies were essentially defensive in design and capability, but as the fourteenth century unfolded, Swiss militias gained the



Map 6.1 The Swiss Wars.

training, discipline and experience necessary for effective offensive action, and the Swiss heavy infantry tactical system was born.

The Swiss phalanx went through a period of evolution in size, composition and armament during its history. The early Swiss phalanx was composed of two or more cantonal contingents, called *banners*, because this is where the standards of the contingents were displayed. Each banner was commanded by its own officers and was divided into subunits called *fahnleins*, or 'little flags', of between 50 and 150 men. Fahnleins were further subdivided into ten-man squads called *rotten* or sections.[5] In the early fourteenth century, when the Swiss Confederation was still small, the cantonal phalanx contained perhaps 900 heavy infantrymen arrayed in a formation of 30 ranks by 30 files. But as more cantons joined the confederation in the late fourteenth and fifteenth

centuries and a national army was born, the size of the battle square increased to 50 ranks by 50 files and around 2,500 men.[6]

The articulation of the Swiss phalanx was excellent, with the battle square organized in deep files. Before the battle of Laupen in 1339, the normal configuration of Swiss forces was the *keil* or wedge formation. This tactical array was less a wedge than a column, narrower than it was deep.[7] When attacked by enemy cavalry, the pikemen in the *keil* faced outwards and lowered their pikes, creating a bristling hedgehog that would be difficult to approach on horseback.[8] By the battle of Laupen, this formation evolved into a true battle square, with the columns becoming squarer as the width of the formation increased.

By simply following the man ahead, the Swiss battle square could maintain its integrity, avoiding gaps like the smaller Roman maniple of the classical age. And like legionaries in the Roman maniple, Swiss infantrymen did not form a line on the battlefield, but usually arrayed in three squares in echelon or in a chequerboard formation reminiscent of the Roman quincunx. These squares consisted of a vanguard or *Vorhut*, smaller than the main body and often including skirmishers armed with crossbows or handguns; a main body or *Gewalthut* much larger than the advance guard; and a rearguard or *Nachhut*, which was usually smaller than the main body as well. The Swiss drilled, marched and even advanced to the attack to the sound of the drum, with some authorities stating that the troops marched in cadence.[9] Swiss drill was sophisticated enough to defend the square in all directions when halted, but unlike usually immobile medieval heavy infantry, the Swiss stressed the offensive, and the militias drilled constantly to improve articulation, producing a battle square comparable to the Macedonian phalanx in manoeuvrability, cohesiveness and shock power.[10]

Initially unarmoured and with no shield, the early Swiss militiaman fought with a *halberd*, a broad-headed axe with an 8 foot handle that had a point for use as a short pike, and a spike opposite the axe blade to hook a cavalrymen's reins or puncture his armour.[11] This weapon proved its worth on the battlefields of Morgarten, Laupen and Sempach in the fourteenth century, but subsequent battles in the fifteenth century between the Swiss phalanx and enemy formations showed the weakness of the short-hafted halberd as an offensive weapon, especially against well-armoured cavalry charges. The Swiss infantryman responded to this threat by adopting a long-hafted pike 10 to 18 feet long with a 10 inch long spearhead, giving him a formidable reach.[12] By 1425 the pike was replacing the halberd as the primary offensive weapon of the Swiss army. By the end of the fifteenth century over two-thirds of the Swiss infantry were armed with this polearm.[13]

When arrayed in a defensive posture for battle, the Swiss infantry square utilized the first four ranks of pikemen to create a 'hedgehog' or hollow square formation, levelling their pikes outward on all four sides to discourage cavalry

charges. Each of the five ranks held their pikes at a slightly different angle to achieve the hedgehog effect, with the first rank kneeling down and holding their pikes near the ground, the second rank stooping down and supporting the butt with their right foot, the third rank holding the pike at waist level, and the fourth rank levelling the spearhead at the enemy's head. The men behind these ranks held their pikes sloping upward to the front to protect the square from missile fire. If the phalanx was advancing in an offensive manoeuvre, all pikes were held at chest level with the spearhead pointed slightly downward for a downward thrust.[14]

As their military and economic fortunes improved, Swiss infantry gradually armoured themselves with steel caps and breastplates, though no standardization of armour ever took place throughout the rank and file, and infantry in the interior of the square continued to wear leather jerkins or padded jackets.[15] Better protected, the armoured pikemen became the major offensive element of the phalanx, though some halberdiers were retained in the centre of the square, where they could attack any enemy, cavalry or infantry that breached the pike wall.

The Swiss tactical system also recognized the need for ancillary weapon systems to support the pikemen and halberdiers in battle. Light infantry crossbowmen, and later handgunners, were usually deployed as skirmishers in front of the vanguard of the main force, engaging the enemy to provide time for the main heavy infantry force to deploy from column to square. Once the phalanx was in position, the light infantry usually retreated between the files and formed in the rear where they acted as flank and rear protection. Also, by the beginning of the sixteenth century, the Swiss stationed within the phalanx special shock troops armed with two-handed swords, morning stars (maces topped with a bristle of long, sharp spikes) and Lucerne hammers (polearms similar to the halberd, but with a three-pronged hammer for the striking area instead of an axe blade). Their mission was to rush out of the pike wall and engage the enemy in close quarters combat.[16]

As the Swiss gained more experience in raising conscript armies, and as these armies grew in size and tactical complexity, strict regulations were introduced governing military service. By the mid-1400s three different kinds of troops were in existence: the *Auszug* or elite forces, composed of mostly unmarried men between the ages of eighteen and thirty; the *Landwehr*, or primary combat force, composed of men willing and able to leave home if the need arose; and the *Landsturm*, or levée en masse of all able-bodied men, a reserve force called to arms only in an emergency.[17] The Swiss were also the first army of the period to repair damaged weapons and armour and take responsibility over soldiers wounded in battle and their widows and children. By 1500 the professionalism of the Swiss army was unsurpassed and 'free groups' of Swiss troops found themselves a wanted commodity as mercenaries in foreign armies.[18]

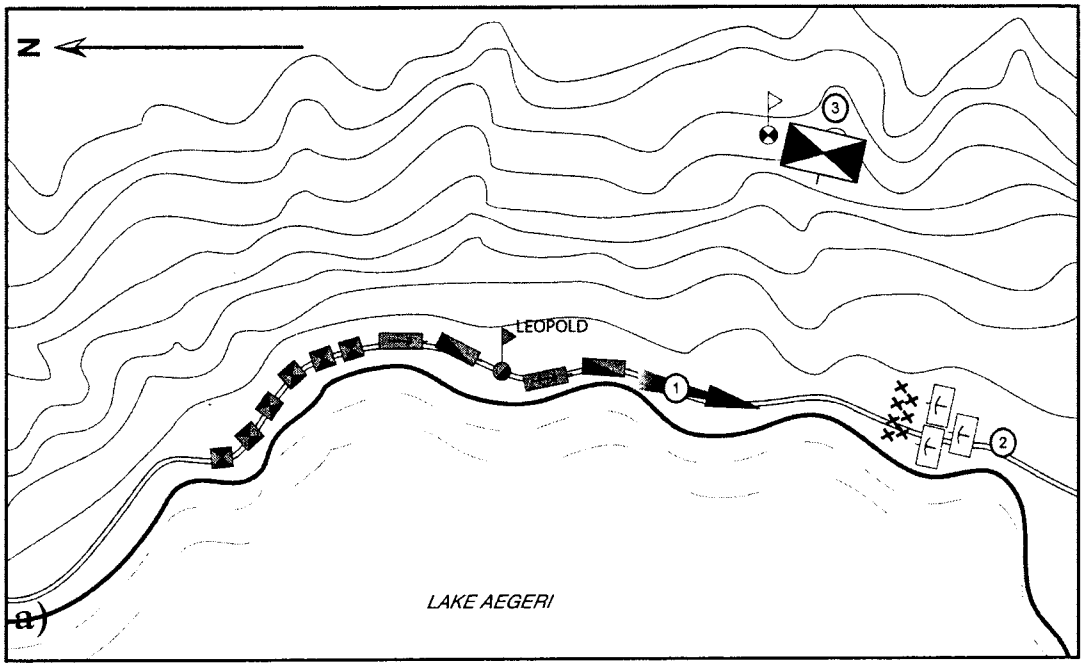
Heavy Infantry versus Heavy Cavalry: The Battles of Morgarten, Laupen and Sempach

As early as 1315 at the battle of Morgarten, the Swiss demonstrated the ability of their well-trained heavy infantry militia to defend their homeland against the heavy cavalry of their Austrian neighbours.[19] For more than twenty years the tensions between the Swiss forest canton of Schwyz and the Austrian Habsburgs stewed as the Austrian monarchy attempted to bring the region under Habsburg hegemony. When the holy Roman emperor Henry VII died in 1314, the citizens of the canton of Schwyz declared their support for the Bavarian candidate, forcing Duke Leopold of Austria to assemble a feudal army from Habsburg lands in Swabia and friendly Swiss cities. In November 1315 Leopold prepared to march into the high forest canton of Schwyz and squash the growing rebellion before it spread to other areas of the country.

The host that Duke Leopold assembled at Zug was composed of between 2,000 and 3,000 men altogether, including perhaps 1,500 mounted knights and an equal number of squires, light infantry crossbowmen and levied unarticulated heavy infantry.[20] Confident in the ability of this sizable army to deal with the peasant uprising in the upland valley of Schwyz, Leopold placed his army in columns and marched south down the eastern shore of Lake Aegeri towards the city of Schwyz (Map 6.2(a)). This route ran through a narrow pass between steep mountains and the lake itself, presenting an excellent place for an ambush.

Knowing the Austrian route in advance, the Schwyz commander Werner Stauffacher marched an army of between 2,000 and 4,000 men (mostly halberdiers with a few crossbowmen) to a ridge above Lake Aegeri that overlooked the narrow mountain road below.[21] The road itself snaked between a steep hillside that led to the ridge and a steep bank which led to the lake below. To best exploit the terrain, Stauffacher sent a small detachment of engineers to the road to hastily build a timber and rock wall. He then reinforced this blocking force with his light infantry crossbowmen, stationing them behind the makeshift obstacle in order to stop the Austrian heavy cavalry from quickly overrunning the defensive position. After blocking the mountain road, the Swiss commander hid most of his men in a shallow ravine atop the ridge until Leopold's vanguard of Austrian heavy cavalry appeared.

Stopped by the timber and rock wall, the Austrian vanguard began to pile up as the rest of the column marched and trotted forward. Aware of his precarious position but believing he faced only a small delaying force, Leopold ordered the knights in the front bataille to dismount and attack the Swiss position and remove the obstacle (Map 6.2(b)). As the defending crossbowmen fended off the approaching dismounted knights from behind the wall, the main body of Swiss attacked from the ridgeline. At first throwing rocks and rolling tree trunks down the slope, the Swiss followed up with a sudden and violent infantry attack. The Swiss phalanx moved out of the ravine and across the edge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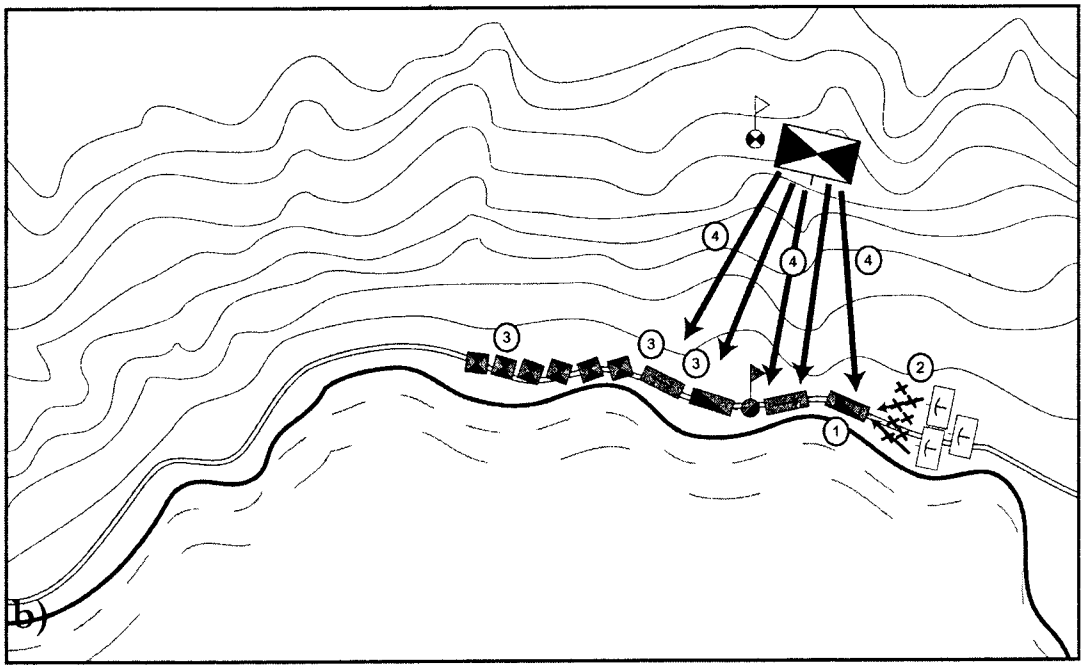
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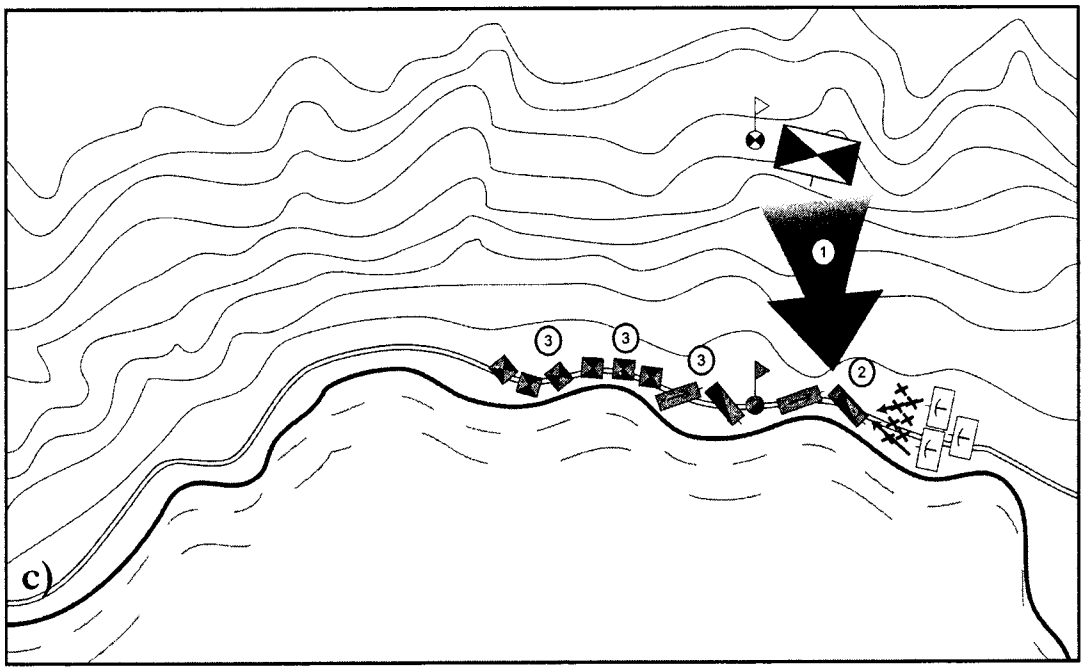
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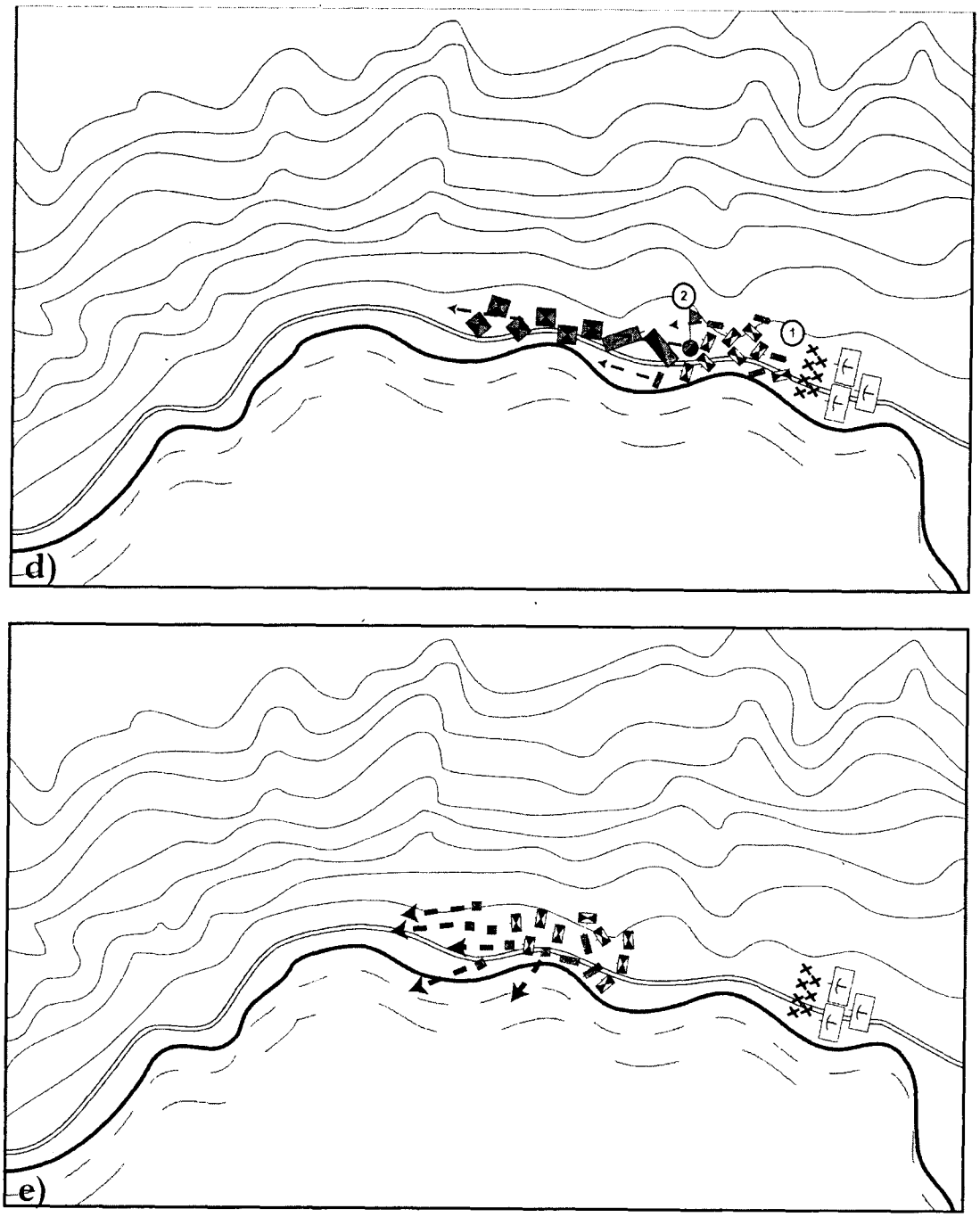


Map 6.2 The Battle of Morgarten, 1315. (a) Phase I: An Austrian army under Duke Leopold advances along the shore of Lake Aegeri (1) to put down a peasant uprising in Schwyz. A Schwyz army commanded by Werner Stauffacher waits in ambush, a force of crossbowmen deployed behind a makeshift wall of timber and stone (2) blocking the narrow road, and another of halberdiers in a shallow ravine atop the ridgeline (3) looking down the steep slope towards the approaching enemy. (b) Phase II: Leopold orders his vanguard to dismount (1), reduce the blockade and kill the defenders. The Schwyz crossbowmen open fire on the advancing Austrians (2) as the remainder of Leopold's men begin to bunch up on the narrow path (3). High above the congested column, Stauffacher's men roll boulders and tree trunks down the steep slope into the Austrians (4). (c) Phase III: The Swiss phalanx emerges from the ravine and advances down the slope (1), gaining momentum as they charge the lead Austrian division (2). The Austrian column becomes even more compressed as the pressure from the rear units increases (3). (d) Phase IV: The Swiss infantry fight their way into the midst of the Austrian ranks and begin slaughtering both man and beast with their halberds (1). Leopold is forced to fight his way through his own troops to escape (2). (e) Phase V: The Swiss halberdiers begin to cut their way through the remaining Austrian troops, many of whom are driven into the lake and drown. The Swiss take no prisoners in the action, helping to establish a reputation for ferocity in battle.

of the ridge, then descended with gathering momentum on the first division of the Austrian column trapped by the extreme terrain and the density of its own army on the road below (Map 6.2(c)). Moments later, the Swiss halberdiers were inside the ranks of the enemy cavalry, dismembering bodies and killing horse and dismounted knight alike (Map 6.2(d)).

The Swiss heavy infantry hacked and hewed their way through the Austrian vanguard, then began working their way down the congested column toward the second bataille where Leopold himself commanded. Unable to push past the timber wall, the duke was forced to literally fight through his own knights and infantry to escape the trap. As the battle raged, many of the Austrians were forced off the road and drowned in the lake below (Map 6.2(e)). Leopold escaped, but perhaps 1,500 of his knights and infantrymen died.[22] Chronicling the battle some twenty-five years later, the monk John of Winterthur writes: 'It was not a battle, but a mere butcher of Duke Leopold's men; for the mountain folk slew them like sheep in the shambles: no one gave any quarter, but they cut down all, without distinction, until there were none left to kill.'[23]

From the battle of Morgarten onward, the Swiss would pride themselves in their battlefield brutality. Breaking with the long medieval tradition of ransoming enemy knights, the Swiss offered no quarter to their foes on the battlefield and any prisoners taken were killed later.[24] The result of this deliberate psychological warfare was a reputation that struck terror into their enemies, adding to the mystique of this emerging tactical system.

The battle of Morgarten marks the return of well-articulated heavy infantry to western Europe after a thousand-year absence. Aided by terrain, tactical surprise and parity in numbers, Swiss heavy infantry took the offensive and destroyed a combined-arms feudal army without the use of heavy cavalry. And though the victory had as much to do with Leopold's stupidity in allowing himself to be ambushed as it did with excellence in Swiss tactics, the battle did illustrate what a well-disciplined and motivated peasant infantry levy could do against the flower of Austrian chivalry.[25]

The Swiss victory at Morgarten established the three forest cantons (Schwyz, Uri and Unterwalden) as a military confederation to be reckoned with. Within a generation after Morgarten, the rebellion against the Habsburgs developed into a union of city republics and rural republics, spreading down into the lowlands. These forest cantons entered into an alliance with the city of Lucerne in 1319, resulting in the origins of a Swiss confederation capable of challenging foreign hegemony. Over the next few decades, Swiss success on the battlefield stimulated the cause for Swiss nationalism, spurring the alliance's enemies to open aggression.

When in 1339 the city of Bern, the largest and most important urban community south of the Rhine, threatened an alliance with the Swiss Confederation, Bern's enemies to the west in Burgundy marched eastward and laid siege to the city of Laupen, 10 miles south-west of Bern. The Burgundians

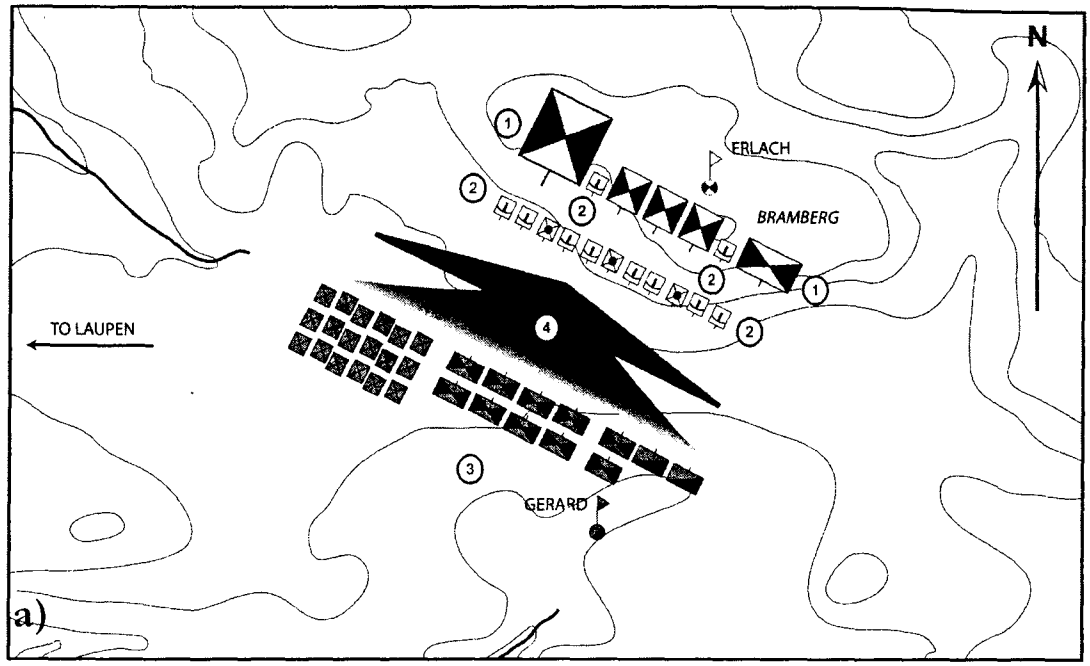
took advantage of years of civil wars to extend their boundaries at the expense of the Swiss, going so far as to support Swiss lords unwilling to join the growing confederation. Under the command of Count Gerard of Vallangin, the besieging Burgundian army was joined by local lords and their levies, swelling to perhaps 12,000 infantry and 1,000 mounted knights.[26]

Dismayed at the strength of this coalition, the Council of Bern asked the forest cantons for aid, offering them both an alliance and monetary subsidies. Unwilling to tolerate a strong Burgundian presence in Swiss affairs, the forest cantons joined with the Bernese militia and, using the cover of the forest, moved undetected to a spot very close to Laupen. On the afternoon of 21 June, the Swiss army assumed a defensive position on the Bramberg, a grassy hill 2 miles east of the besieged city (Map 6.3(a)).

The Swiss force was commanded by an experienced Bernese knight named Rudolf of Erlach and numbered 6,000 men, including 1,000 men from the forest cantons. Believing the enemy would sooner or later have to break their siege and challenge an army at their backs, Erlach arrayed 1,000 halberdiers from the forest cantons on the left, just outside the skirts of the woods along the crest of the gentler slope of the Bramberg. The Swiss centre consisted of three 900-man Bernese phalanxes armed with long infantry pikes, unusual weapons for Swiss militia at this early date. These three battle squares were arrayed 30 men wide by 30 men deep. On the right, Erlach placed a larger Bernese battle square 2,000 strong, arrayed 50 men wide by 40 men deep. Finally, Erlach deployed a small contingent of light infantry crossbowmen, supplemented by a few medieval handgunners, in front of the phalanxes and in the gaps between the battle squares. To distinguish themselves from their enemy on the battlefield, the Swiss sewed white crosses on their clothing, an emblem later adopted as the national symbol.[27]

Count Gerard was surprised by the sudden appearance of the Swiss relief army, but was granted time to array his own numerically superior forces when the Swiss took a defensive position on the Bramberg. He placed all of his 1,000 heavy cavalry on his own right wing opposite the confederate halberdiers, intending to charge up the gentler slope of the hill and then turn the Swiss flank inward. The count then placed his 12,000 heavy infantry in the centre and right wings. Anchoring the centre were a cadre of well-equipped heavy infantry from the coalition city of Freiburg, while the left was occupied with a large contingent of unarticulated infantry described by contemporary chroniclers as 'raw and ill-armed bands'.

The battle of Laupen began late in the afternoon when Count Gerard ordered a general assault up the Bramberg toward the Swiss position. As the mass of coalition cavalry and infantry climbed the hill, Erlach ordered his light infantry forward to meet the attack with bolts and shot (Map 6.3(b)). After some initial skirmishing, the Swiss crossbowmen and handgunners filtered back through their heavy infantry squares. As the light infantry made its way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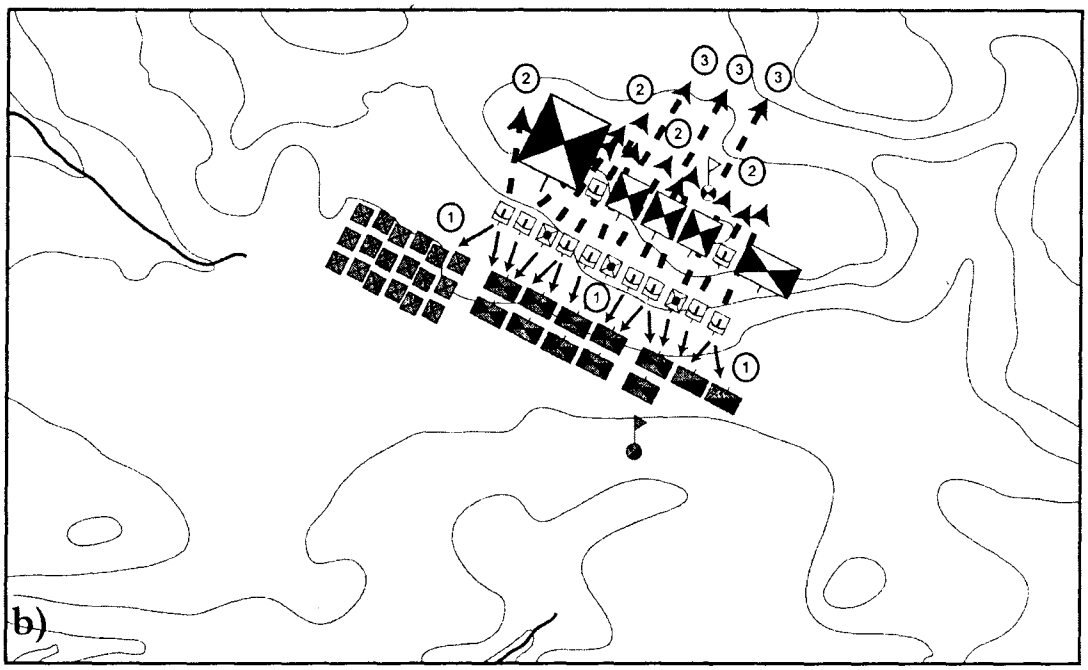
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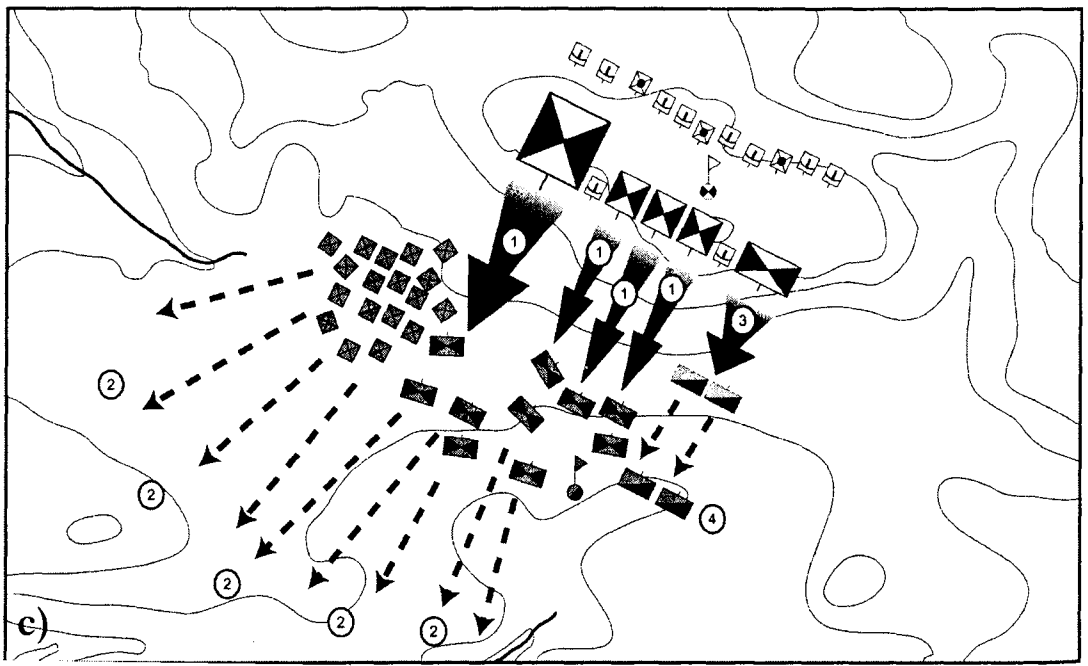
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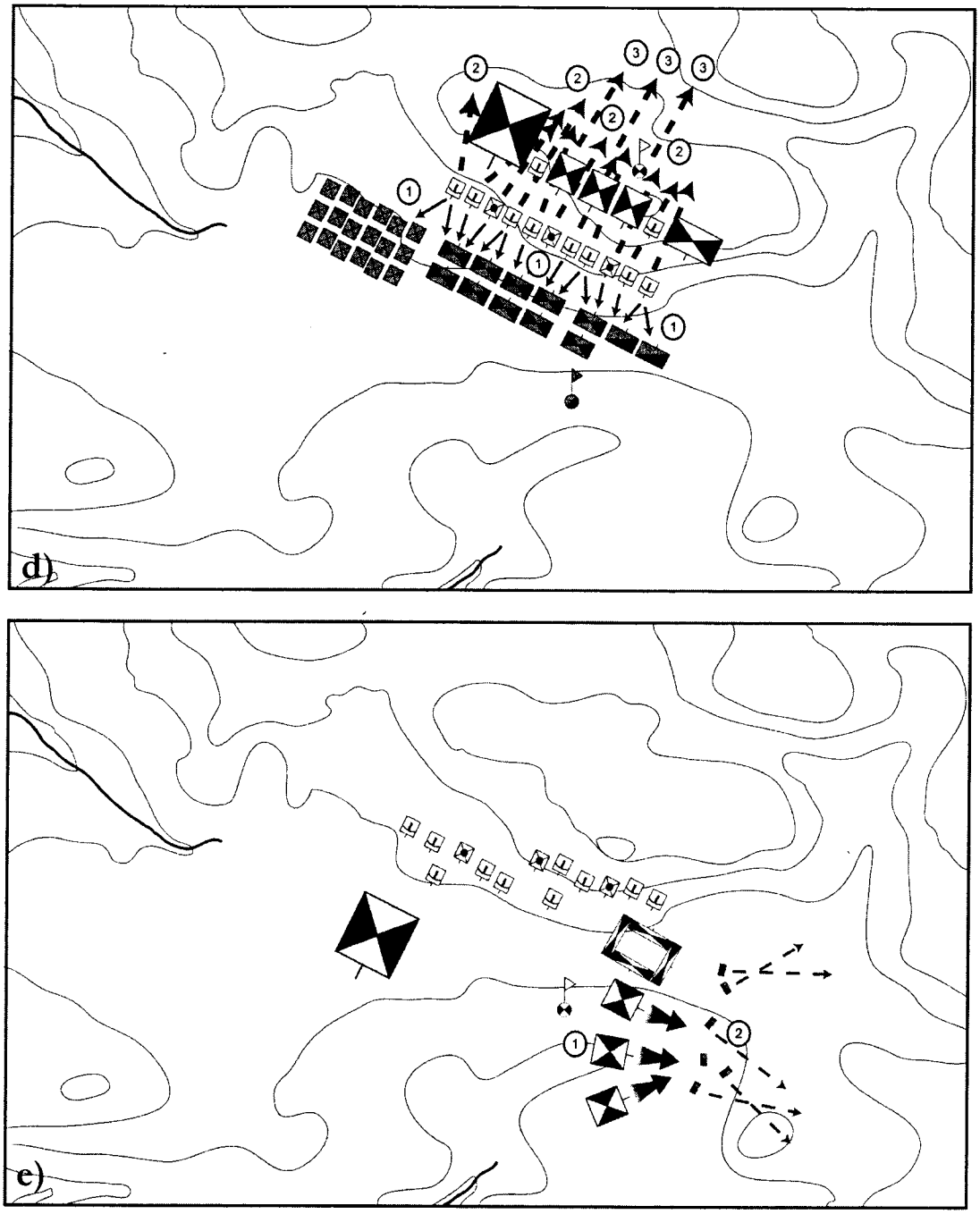


Map 6.3 The Battle of Laupen, 1339. (a) Phase I: The Swiss army deploys along the crest of the Bramberg, just east of Laupen (1). Halberdiers from the forest cantons are on the left, three Bernese pike squares in the centre, and a much larger square of Bernese infantry is on the right, screened by and interspersed with light infantry crossbowmen and a few handgunners (2). The Burgundians interrupt their siege of the town and array themselves opposite the enemy relief force on the low hill (3). Gerard orders a general advance (4). (b) Phase II: The Swiss crossbowmen and handgunners open fire on the advancing troops (1) and then fall back through their infantry squares (2), re-forming to the rear of their phalanxes. Several ranks of Bernese infantry break and run for the woods to the rear (3). (c) Phase III: Erlach orders the Swiss infantry to charge (1), and the coalition and Freiburger infantry scatter (2). On the Swiss left, the charging halberdiers (3) collide with the oncoming heavy cavalry. Unlike the infantry, the horsemen withdraw in good order and re-form (4). (d) Phase IV: The Burgundian heavy cavalry charge the halberdiers (1), who quickly form a hedgehog (2) against the assault; however, the short-hafted halberds fail to provide much protection against the knights. Erlach orders his infantry squares to wheel left to assist their beleaguered comrades (3), catching the enemy in the flank and rear. (e) Phase V: The Swiss charge (1) shatters the enemy cavalry. Many are killed and the survivors scattered (2). Swiss losses are light and are almost entirely from among the ranks of the halberdiers on the left.

to the back of the phalanxes, several ranks of the centre Bernese phalanx broke and ran for the protection of the woods. Undeterred, Erlach ordered his entire army downhill to engage the enemy (Map 6.3(c)).

The Swiss halberdiers from the forest cantons clashed head-on with the massed heavy cavalry directly to their front. Though the Swiss infantry's downhill charge shattered the Freiburger and coalition infantry in the centre and on the left, the well-trained Burgundian feudal heavy cavalry on the right fell back, re-formed and counter-attacked the forest canton halberdiers, striking the square's front, flank and rear. Under attack, the halberdiers halted and formed a hedgehog, lowering their weapons and facing their formation in all four directions to repel repeated charges by feudal cavalry (Map 6.3(d)). But the short-hafted Swiss halberd, ideal for inflicting horrible wounds against enemy foot and horse during the offensive, was not as efficient as the long-hafted pike in keeping enemy cavalry at bay when in a defensive formation.[28]

Seeing the beleaguered halberdiers, Erlach ordered his victorious Bernese phalanxes to wheel 90 degrees and strike the heavy cavalry attacking the forest canton units on the Swiss left, catching the enemy horsemen in the flank and rear with complete surprise and shattering the enemy horse (Map 6.3(e)). And though casualties were generally light where infantry clashed, the flank attack against coalition cavalry caused heavy casualties, with perhaps as many as 1,500 nobles and commoners dying. Three counts and eighty barons and bannerets were killed, along with several hundred of their men-at arms. The victors displayed twenty-seven feudal banners and seventy crested helms as trophies when they returned home the next day. Swiss casualties were moderate and almost entirely among the men of the forest cantons.[29]

At the battle of Laupen, Swiss militia demonstrated that it could win a battle under less favourable circumstances than the battle of Morgarten, specifically on an open field against unarticulated heavy infantry supported by feudal cavalry.[30] The Swiss victory at Laupen also illustrated the tactical mobility and capacity of the battle square to defend against all-round attacks, even when the defenders were wielding short-hafted halberds.

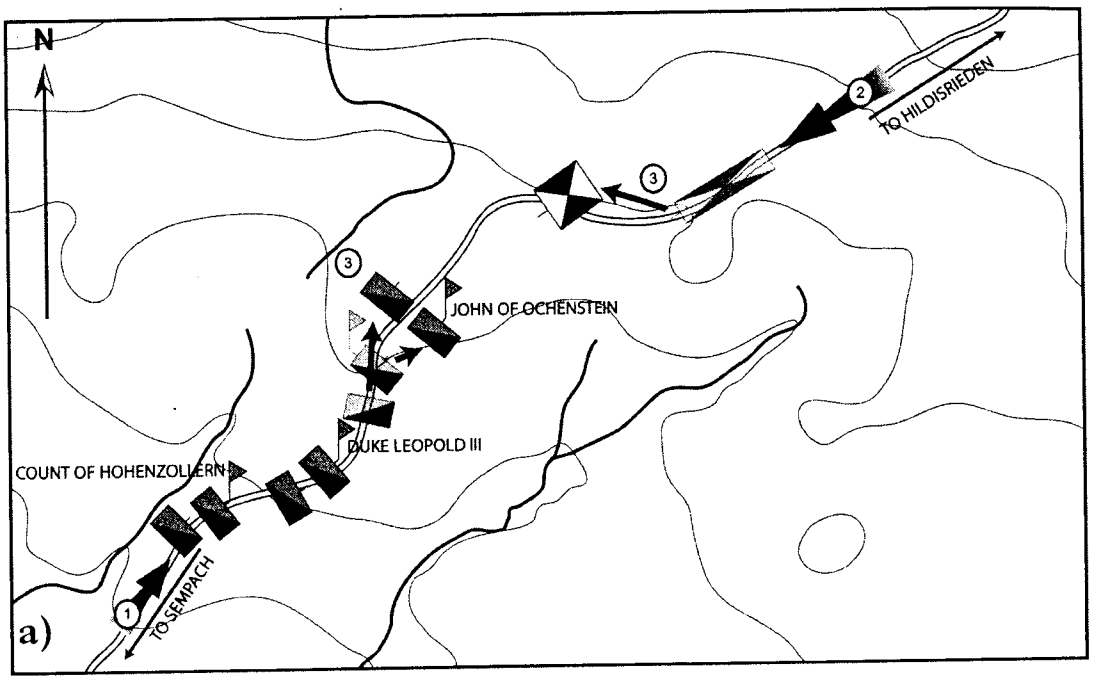
Having begun as a defensive alliance between three forest cantons in 1307, the Swiss Confederation had, by 1386, grown into a formal political and military alliance designed to safeguard Swiss national independence from intrusion by the house of Habsburg. The city of Lucerne joined the confederation in 1332, while Zurich joined in 1353, Zug and Glarus in 1352, and Bern in 1353. As the Swiss Confederation grew and became more confident in its military capabilities, it began to challenge Habsburg possessions south of the Rhine. In 1386 the Swiss took the offensive and attacked the small town of Sempach, sacking Habsburg fortresses and laying to waste agricultural areas loyal to the local Habsburg lord, Duke Leopold III, nephew of the Leopold defeated at Morgarten.[31]

In the summer of 1386 Leopold raised a formidable army of 4,000 men, including 2,500 feudal infantry and 1,500 knights and mercenaries, and marched into Switzerland to punish the Lucerners and regain his lost territory.[32] He marched on Sempach and surrounded the city, entrapping its garrison, then continued further along the road to intercept any Swiss relief forces moving in east from Zurich. The strength of the Swiss army in and around Sempach was between 6,000 and 8,000, and the vanguard marching on Sempach consisted of between 1,500 and 2,000 men composed entirely of the levies from Lucerne.[33] As the two hosts moved toward each other, neither army deployed advance scouts. Around noon on 9 July, lead elements of two armies stumbled into each other on a hillside road, a mile and a half north-east of Sempach, near the village of Hildisrieden (Map 6.4(a)).

Immediately after making contact with the Austrian vanguard, the Swiss deployed for battle on a piece of level ground halfway up the terraced slope of the mountainside. Meanwhile, the Austrian army, marching in three batailles, was strung out in column when their van made contact. The first corps was Austrian and commanded by John of Ochenstein, the second corps by the duke himself, and the third division was composed of Alsatian, Swabian and hired mercenaries under the command of the count of Hohenzollern. Well aware of the Swiss phalanx's ability against mounted attacks, Leopold ordered the knights of the first division to dismount and fight as heavy infantry (Map 6.4(b)). He believed his heavy cavalry's lances would make excellent infantry spears, outreaching the enemy's halberds, and that their superior plate armour would protect them in their assault against the less protected Swiss militiamen. The remaining two Austrian divisions remained mounted and ready to charge the Swiss infantry square once it had lost cohesion.

Believing the entire Swiss army was in front of him, Duke Leopold commanded his light infantry crossbowmen to harass the Swiss phalanx, then ordered his dismounted knights up the hill to attack the weakened Swiss battle square (Map 6.4(c)). Wielding their lances as infantry pikes, the Austrian knights waded into the Swiss formation. Soon, Swiss losses mounted and the phalanx began to collapse. As the Lucerne banner fell into Austrian hands, Leopold prepared to order a general cavalry charge against the disintegrating Swiss square.

But before the Austrian duke could order the cavalry to the attack, the main body of the Swiss army appeared over the rise near the village. Led by the men of Uri, the Swiss army immediately moved from line of column into the attack, smashing into the flank of the dismounted knights (Map 6.4(d)). The sudden assault was devastating. Fresh and superior in numbers, the Swiss halberdiers hacked and hewed into the Austrian knights who were themselves becoming exhausted after fighting for an hour in plate armour. Watching the knights of his first division being trampled under the Swiss assault, Leopold jumped from his horse and ordered the mounted and dismounted knights of his second corps to follow him into the fray.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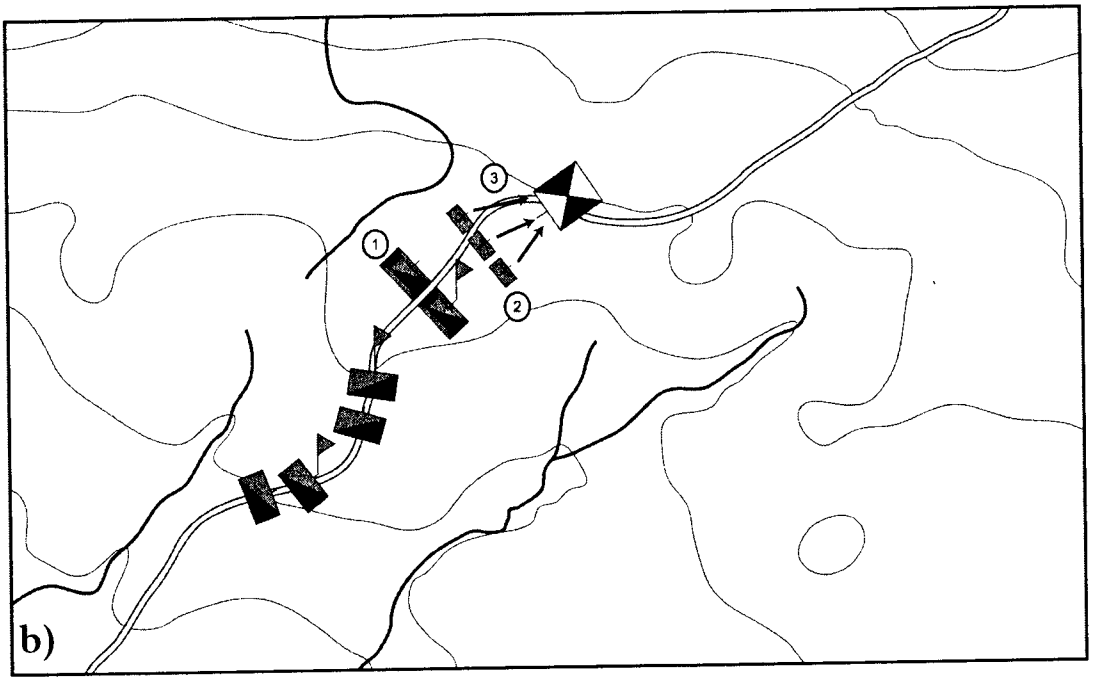
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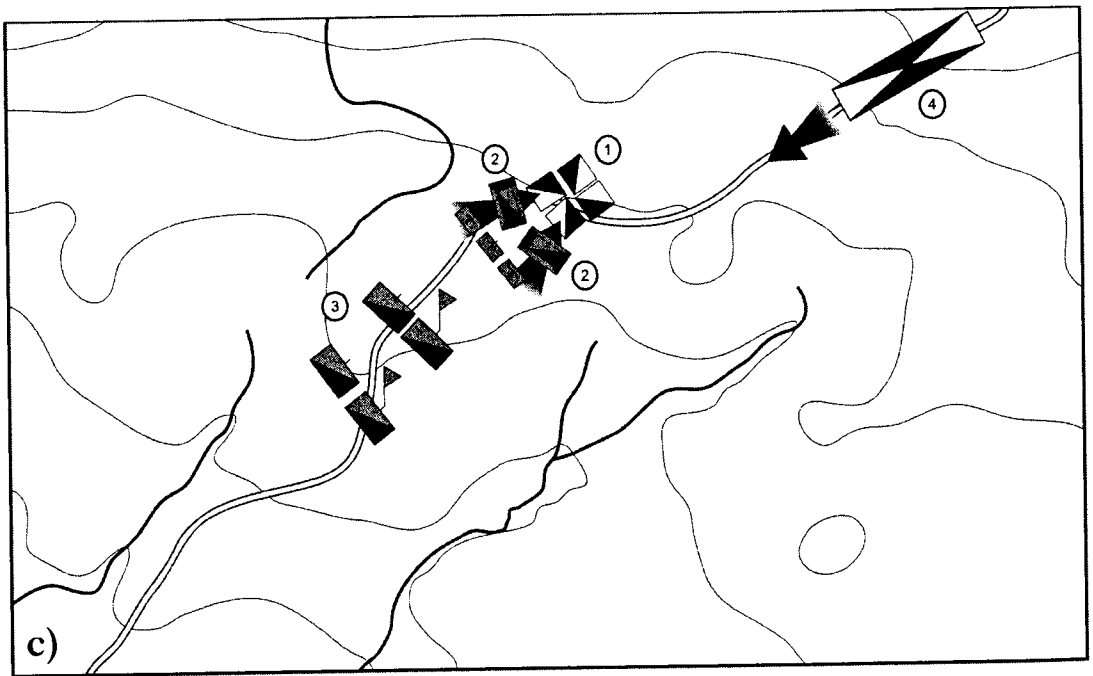
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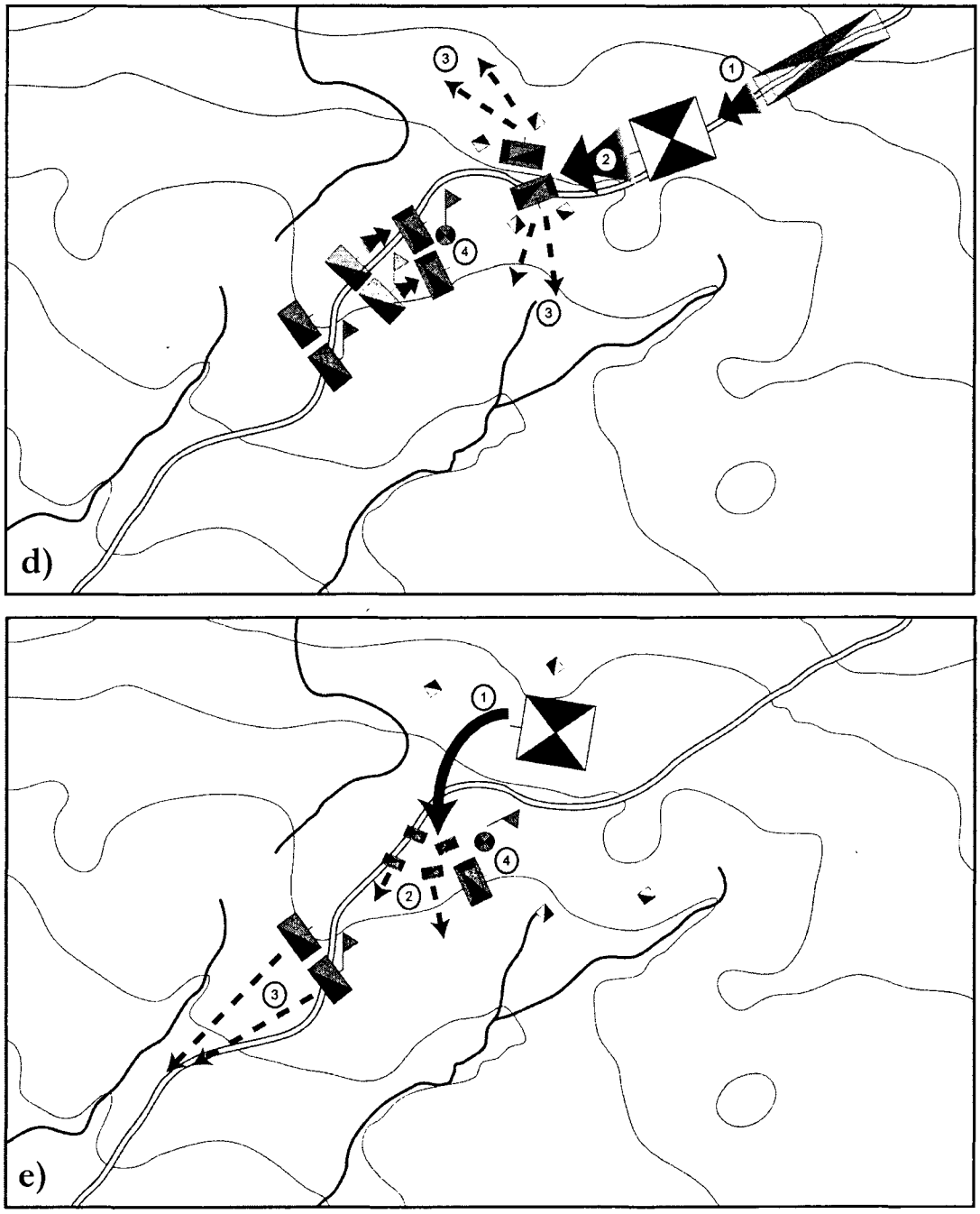

Map 6.4 The Battle of Sempach, 1386. (a) Phase I: Marching north-east from Sempach (1), Duke Leopold's Austrian army is unaware of the approach of a Swiss force moving towards him on the same road (2). The Swiss vanguard and the Austrians' first division spot each other and begin to deploy (3). (b) Phase II: Recognizing the threat from the Swiss phalanx, Leopold orders his lead division to dismount (1) and deploys light infantry crossbowmen (2) to fire into the Swiss battle square to begin chipping away at the formation (3). (c) Phase III: The Swiss battle square begins to lose cohesion (1) and Leopold orders his dismounted knights into the fight (2). The Austrians inflict heavy losses on the Swiss, and Leopold readies his mounted knights for a charge (3) to finish off the disintegrating phalanx, but before the duke can order his horsemen forward, the Swiss main body appears over the rise towards Hildisrieden (4) and heads down the slope towards the action. (d) Phase IV: The Swiss quickly deploy from column into battle square (1) and smash into the flank and rear of the dismounted first division (2). Fatigued after an hour of fighting and faced with a seemingly unstoppable mass of fresh halberd-wielding infantry, the Austrians begin to rout (3). Leopold leaps from his horse and orders his division forward against this new menace (4). (e) Phase V: Before Leopold can launch his counter-attack, the Swiss wheel their square in a devastating assault on the Austrian flank (1). Though the Austrian knights fight bravely, they are gradually overcome by the Swiss halberdiers (2). The count of Hohenzollern, commanding the Austrian reserve, panics and orders a precipitate retreat (3), causing the squires and pages tending to the second division's horses to look to their own safety and flee as well, abandoning their masters, including Duke Leopold, to certain death at the hands of the Swiss infantry (4).

But before the counter-attack of the Austrian second division could form, the attacking Swiss phalanx turned 90 degrees and struck the Austrians (Map 6.4(e)). In the swirling mêlée, Duke Leopold and his knights fought well, but in the end they were overcome by enemy halberdiers.[34] Watching the disintegrating situation from a distance, the commander of the Austrian reserves lost his nerve and turned and fled the field. Once the third division left, the squires and pages who were tending the horses of the second division also fled, abandoning those knights who were able to disengage from the mêlée. Exhausted and outnumbered, these knights were cut down where the Swiss found them. Austrian casualties were 1,800 men, including the duke himself, three counts, five barons and seven bannerets. Swiss losses were about 120 men and mostly among the vanguard.[35]

When the corpses of the fallen at Sempach were exhumed in 1898, archaeologists discovered that almost all of the Austrian dead had been killed by having their skulls split open by halberds. Leopold's tactical calculation to have his dismounted knights use their lances as infantry pikes against Swiss heavy infantry halberdiers proved disastrous. If the halberd was too short for an effective defence against enemy heavy cavalry, in close quarter combat it worked murderously well against the lance.[36] At the battle of Laupen, Swiss heavy infantry proved they could beat the knight on his horse, while at the battle of Sempach they proved they could beat him dismounted as heavy infantry, on fair ground and with no great disparity in numbers.[37]

As the Swiss expanded their confederation, they began to threaten the power of the Habsburg dynasty. In the spring of 1444 the Habsburg emperor Friedrich III asked the French king Charles VII for assistance with the growing Swiss alliance. Charles dispatched a huge army of 40,000 men to penetrate confederate territory through Alsace, securing Basle as a bridgehead. On receiving news of an invasion army, the confederate city of Bern sent a small reconnaissance force of 1,200 men northward to observe the French army. But at the Birs River near the small hospital of Saint Jacob, the Swiss army was confronted by the entire French host.

Refusing to retreat, the 1,500 Swiss infantrymen grouped immediately into three squares, levelled their pikes and launched an attack into the French lines. In what became known as the battle of Saint Jacob-en-Birs, the Swiss squares made a profound impression when they attacked a French army, even though they were outnumbered perhaps fifteen to one.[38] French cavalry assaults on the flanks of the battle squares halted the Swiss, then the French used their crossbowmen to wear down the immobile squares. After five hours of rebuffing enemy cavalry charges, the Swiss managed to withdraw to the small hospital of Saint Jacob, which was surrounded by a wall high enough to offer some protection. The disciplined Swiss stood their ground and, in the face of artillery barrages and crossbow bolts, suffered heavy casualties. As the walls of the hospital were reduced to rubble, the French foot stormed the courtyard. In

the bitter hand-to-hand combat that followed, the Swiss died to a man. Like the Spartans' defence at the battle of Thermopylae nearly two thousand years earlier, the Swiss stand at Saint Jacob-en-Birs elevated the status of the battle square in western European warfare.

The Burgundian Wars: A New Combined-Arms Synthesis versus Swiss Heavy Infantry

The reputation of the Swiss tactical system was further enhanced in campaigns against the duke of Burgundy, Charles the Bold (r. 1465–1477). Charles had operated with impunity against the French crown following his defeat of King Louis XI of France (r. 1461–1483) at Monthlhéry in 1465. After Charles's follow-on victories at Liège (1466) and Brustem (1467), he turned his attention to the Swiss on his eastern front. Here, the growing Swiss Confederation provided the military opposition to his plans. In order to weaken the Swiss, the duke of Burgundy planned to divide and conquer, cutting a path through the alpine alliance with the most modern army he could assemble.

To meet this objective, Charles fielded a well-financed combined-arms army of 30,000 men, consisting of Burgundian heavy cavalry, Flemish heavy infantry pikemen, Italian light infantry crossbowmen, German arquebusiers and mounted light infantry English longbowmen. Traditionally, Burgundian armies were small, with mercenaries making up at least 30 per cent of any force. But Charles's grand ambitions required a larger fighting force, and beginning in the early 1470s, the duke strove to create permanent troops in mixed units (companies) of heavy cavalry, heavy infantry and light infantry archers, crossbowmen and handgunners, supported by the most modern artillery available.

Gunpowder technologies appeared on the battlefields of western Europe some time in the middle of the thirteenth century. Gunpowder was first utilized as a weapon by the Chinese prior to 1000 CE, where it was made into bombs and rockets. The likely conduit of diffusion from China was through Islamic lands to Byzantium or to Spain, then north of the Pyrenees to western Europe. References to gunpowder weaponry were included in armouries in Lille, Lucca, Aachen, London and Siena in the late 1330s and 1340s, and it appeared at the sieges of Tournai in 1340 and Calais in 1346–1347, and perhaps even at the battle of Crécy in 1346.[39]

The first cannon made in Europe, in the early fourteenth century, were vase-shaped tubes which fired huge darts like those shot from the old Roman *ballistae*. Over time the darts gave way to round stone or metal projectiles and the barrels evolved into a straight tube. But over the next 150 years gunpowder weaponry underwent a spectacular evolutionary process as guns became less frequently forged and more frequently cast, increasing both reliability and durability. These improvements also allowed gunsmiths to make their weapons both much larger and much smaller, with the largest guns being capable of