The Black Death and the Intellect of Europe

By NATHANIEL WEYL

The Black Death, a pandemic of bubonic plague which swept across Europe between 1347 and 1350 was probably the greatest single disaster—measured by the proportion of mankind that it killed—in history. The pioneer German medical historian, J. F. C. Hecker, estimated that 25 million Europeans of a population of 105 millions perished.[1] George Macaulay Trevelyan thought that from a third to a half of the English people died. An Italian scholar estimated the toll at 40 per cent to 60 per cent of the urban population of Italy.[2] A modern writer believes that the mortality for Europe as a whole ranged somewhere between 23 and 45 per cent.[3]

The question we are here concerned with is not: How many died? Rather it is: On what groups and classes in the population did plague mortality fall most heavily? We know that the Black Death was genocidal. Was it aristocidal as well?

To attempt to answer this question by comparing the estimated population of Europe immediately before and immediately after the disaster and by attempting to weigh against that gap the indicated mortality among specific classes and professions would involve such large margins of error that the end-result would be of dubious value. A more direct approach to the problem is to examine how the plague was transmitted and then ask what groups of people lived under conditions of maximum—and also of minimum—risk of infection.

VECTORS OF THE PLAGUE

Bubonic plague is caused by the infection of the body with the plague bacterium, *Pasteurella pestis*. This is an internal parasite of rodents, particularly rats. The normal course of infection is for one of two species of fleas, of which by all odds the more common is *Xenopsylla cheopis*, to feed on diseased rats and thus ingest the plague bacterium with the rat's blood. The plague bacteria

[1] J. F. C. Hecker, *The Epidemics of the Middle Ages*, London, 1844, pp. 30-31.

[2] A. Doren, *Storia Economica dell'Italia nel Medio Evo*, Padua, 1937, p. 579.

[3] Philip Ziegler, *The Black Death*, New York, 1969, p. 230.

establish themselves in the flea's stomach where they rapidly multiply until they occupy its entire mass. When this occurs, the rat-flea is said to be in a "blocked" state. No food can reach its stomach or nourish it. The flea becomes ravenous and, no matter how much it sucks blood, inevitably starves.

When these famished insects attack human hosts, they suck the blood of the latter until their gullets become so enlarged that they contract involuntarily, forcing regurgitation. While the flea sucks blood, it defecates. Both the plague-infected regurgitated matter and the plague-infected feces are introduced into the blood stream of the human host through the puncture made by the flea. Thus, the human being becomes infected.

Since the fleas fed preferentially on rats, they generally abandoned them for human hosts only when they were dead and cold and when other rats were not immediately available. The presence of abnormally large numbers of dead rats in the houses and streets of medieval cities was a harbinger or sign of bubonic plague.

Not more than 12 per cent of the fleas preying on black rats belong to the two species which serve as plague carriers. Infection through the more direct route of man-flea-man is virtually impossible because *Pasteurella pestis* does not reach high enough concentrations in the human blood stream. However, direct man-to-man infection is entirely possible if the plague infects the lungs of a human being. In this pneumonic form of the pestilence, mortality approaches 100 per cent.

Climate affects the course of the epidemic. *Cheopis,* the most prevalent flea-carrier of bubonic plague, thrives best at temperatures of between 64 and 72 degrees Fahrenheit. In its blocked state, *cheopis* can be killed by cold snaps, heat waves and drought.[4]

The mammal carrier of bubonic plague is *Rattus rattus,* the house rat, or so-called black rat. This rodent is timid and non-ambulatory. It normally lives in or around houses, using for its own purposes the shelter which man erects and eating by preference such human foods as grain. The house rat avoids water and will not migrate or cross rivers on its own initiative unless compelled to move by famine, epidemic disease or natural disaster. The house rat normally spreads over an area only to the extent that is moved by human agencies such as ships, caravans or wagons.

The original home of the black rat was probably India. It may have burst into the Mediterranean world around the time of

[4] For an admirable detailed and recent account of the vectors of bubonic plague, one on which I have leaned heavily, see J. F. D. Shrewsbury, *A History of Bubonic Plague in the British Isles,* Cambridge, 1970. Dr Shrewsbury is Emeritus Professor of Bacteriology at Birmingham University.

Alexander the Great, although it is possible that it did not arrive there until the Christian era.[5]

The plague of Justinian, which began in 540 A.D., was the most disastrous in the medical history of the ancient world. Its admirably clear description by Procopius leaves no doubt that it was bubonic. It reportedly caused 10,000 deaths daily in Constantinople alone, contributed to an unknown extent to Justinian's failure to re-establish a unified Roman Empire, and was characterised by one medical writer as perhaps "the most terrible (pestilence) that has ever harried the world.[6]"

Why did this disaster occur at the time it did?

One reason was the conversion of Rome to Christianity two centuries previously. Pagan Rome had a water, sewerage and sanitation system that Europe would not be able to match for the next thousand years. A hundred years after the birth of Christ, 10 aqueducts supplied the Eternal City with abundant amounts of pure water for its two million inhabitants. About half of this was set aside for the great public baths which were available to the populace at a reasonable cost.

When Constantine the Great brought the Roman Empire to Christianity, the Church was able to destroy these and other public institutions devoted to bodily cleanliness. Leaving his native Dalmatia, St Jerome came to Rome in the middle of the fourth century. He was aghast to discover that the city had 900 public baths. He considered them resorts of sin and urged that they be transformed to baptistries. As Darlington summed it up: "The man who had bathed in Christ, in his opinion, needed no second bath.[7]"

For centuries, the Church would associate the public baths, which were sometimes centres of prostitution, with the sin of lust. The Italian word for bath, *bagnio,* also meant, and still means, brothel.

The Church brought about a vast regression toward bodily and urban filth in that portion of the world which it dominated. Consequently, Christendom suffered from plagues and other diseases of dirt for at least 12 centuries. The elimination of public baths and the desuetude or destruction of the admirable Roman

[5] The Great Plague of Athens during the Peloponnesian War was almost certainly not bubonic because its historian, Thucydides, did not mention swollen bubos as a symptom and because there is no good reason to suspect that *Rattus rattus* was in Greece at the time. The first clear description of bubonic plague comes from Rufus of Ephesus who flourished around 100 A.D. He refers to earlier plagues and cites authors whose works have been lost. The date assigned to the appearance of *Rattus rattus,* therefore, depends on whether Rufus was accurately summarizing older writers or imputing to them his own observations.

[6] Frederick F. Cartwright, *Disease and History,* New York, 1972, p. 17.

[7] Cyril D. Darlington, *The Evolution of Man and Society,* New York, 1969, p. 300.

aqueducts made bodily cleanliness impossible for the poor and inconvenient for the rich. The plague-carrying fleas that earlier pagan generations would have reduced in number or eliminated by frequent baths and changes of clothing were now regarded as part of man's natural lot. Their presence or absence was unimportant since they had nothing to do with salvation of man's immortal soul.

Given this descent from cleanliness to squalor, how does it happen that, after Justinian's plague and its *sequellae* disappeared around 590 A.D., Europe remained free of bubonic plague—or at least no authenticated epidemics of this particular pestilence occurred—for about seven centuries?

The event that probably caused this temporary immunity, according to the distinguished French medieval historian, Henri Pirenne, was the rise of Islam and the consolidation of its political power. This new empire served as a formidable barrier between India, the habitat of the plague-carrying rat, and Europe.

Mohammedans did not share the Christian aversion to washing. The *Koran* imposes daily ablutions, though generally merely of a ritual character, as a religious duty. At a time when the vast public baths of Caracalla and Diocletian lay abandoned, Muslim Cordoba boasted, perhaps with exaggeration, of 700 public baths.[8]

The final disappearance of bubonic plague from Europe was caused in part by the appearance of a rival rodent species, *Rattus Norvegicus,* the Norwegian rat, brown rat, or field rat. Vast migrations of this steppe-dwelling rodent from Russia to western Europe were reported toward the beginning of the eighteenth century. The brown rat apparently arrived in England by sea in 1728, in France and Prussia in 1750, in the United States in 1775, in Switzerland in 1809 and in Spain possibly as late as 1880.[9]

Stronger and fiercer than *Rattus rattus,* the brown rat does not have a symbiotic relationship to man, migrates at will, and has no fear of crossing water. Since the brown rat normally lived in the fields, it was not dangerous to man as a bubonic plague carrier. The invading brown rat rapidly drove off and destroyed its rival, becoming the only species of quantitative importance in most of Europe and other temperate-zone areas. The black rat withdrew to such enclaves as ships, waterfronts and tropical regions.

THE GEOGRAPHY OF DEATH

The Black Death struck Europe in the winter of 1346-47. Its

[8] Will Durant, *The Age of Faith,* New York, 1950, p. 302.

[9] J. F. D. Shrewsbury, *op. cit.,* p. 9.

first point of contact was Kaffa, a fortified Genoese trading post and cathedral town in Crimea and on the Black Sea. Kaffa was located on one of the safer routes of trade between India and Europe; by sea from Indian west coast ports to the mouth of the Tigris, up the Tigris by smaller vessels toward the stream's source in Armenia, then overland by caravan to the Black Sea.

Presumably, plague-infected black rats were carried by ship and caravan from India to the Crimea. In 1346, bubonic plague broke out among Tartar forces which were besieging Kaffa and had almost reduced its defenders to starvation. The Tartars loaded their catapults with the corpses of plague victims, which were then hurled over the city walls, scattering plague-infected fleas into a crowded area swarming with house rats.

From Kaffa, the plague moved primarily by sea, covering the entire coasts of the Mediterranean by the summer of 1347. Moving inland and by Atlantic sea routes, the bubonic plague did not reach Scandinavia and Russia until 1350. Significantly, a large region deep in the interior of the European continent, comprising most of Bohemia and much of Poland, remained substantially free of the Black Death, as did other and smaller enclaves, one of which was isolated by the Pyrenees.[10]

The Black Death struck hardest at seaports and coastal regions. Since the house rat avoided water crossings where possible, interior regions protected by swamps and marshes were comparatively immune.[11]

The cities suffered far more severely than the countryside. The primary reason for this is that the house rat would have no trouble in moving from dwelling to dwelling in the crowded towns of medieval Europe, whereas, in a large part of the countryside, the population density was too low to make the migration of plague-infected rats probable or to complete and perpetuate the chain of infection.

There is a consensus of evidence in support of the proposition that bubonic plague epidemics were primarily an urban affliction. Doria, in a reference already cited, estimated that the Black Death killed 40 per cent to 60 per cent of the inhabitants of Italian cities, but affected a far smaller proportion of rural Italians. Shrewsbury states that this pestilence "by reason of its immutable nature, is principally an urban disease. . . ." He believes that the rural death toll in England did not exceed 5 per cent of the population, an extremely low figure which few other authorities would accept.[12] At least five English counties had "population densities so low that it would have been biologically

[10] Philip Ziegler, *op. cit.*, map on pp. 105-106.

[11] J. F. D. Shrewsbury, *op. cit.*, p. 54.

[12] J. F. D. Shrewsbury, *op. cit.*, p. 123.

impossible for bubonic plague to have spread over any of these counties in the fourteenth century.[13]"

Where the plague raged in its pneumonic form population density would be the greatest single factor determining potential contagion. Here again, the cities would suffer far more severely than the countryside.

Then as now, most of the upper class, of the clergy, of the administrative and military bureaucracy, of the intellectuals and the professionals, of the merchants, manufacturers and skilled artisans, were concentrated in the towns and hence lived in the areas of maximum exposure. Within the rural regions, the geographical impact would involve greater morbidity in the densely, than in the sparsely, populated rural regions. Since the former generally have better land, a legitimate inference would be that, within the rural regions, the richer areas and consequently the more capable and successful cultivators would be the principal victims.

If Shrewsbury and other authorities are even approximately right about the differential between urban and rural Black Death mortality, then the pandemic must have afflicted southern Europe far more massively than northern Europe. The reason for this is that the great cities of the Continent at that time were almost entirely on, or adjacent to, the Mediterranean. Using a variety of different estimates, culled by Will Durant and Henri Pirenne from different sources,[14] we find that Constantinople was believed to have had a population of 800,000 and Cordoba and Palermo about half a million each. By 1300 A.D., Paris boasted 150,000 inhabitants; Venice, Milan and Florence were probably slightly below 100,000. Among the trans-Alpine cities, London had 35,000 inhabitants in 1377, while Cologne, Luebeck and Nuremberg were even smaller. England was 90 per cent rural. Scandinavia, Scotland and Ireland remained overwhelmingly countryside.

Thus, several generalizations have been made about the distribution of bubonic plague epidemics. In each case, they have been derived from the nature and behavior of the plague vectors. The first obvious necessity was for *Rattus rattus* to be introduced into the Mediterranean world and for enough time to elapse so that this rodent population could achieve sufficient density so that the pestilence could be spread by haphazard rat contacts. This probably occurred either around the beginning of the Christian era or several centuries earlier. A second factor was the lapse from the fairly high standards of personal cleanliness prevailing in pagan Rome. This meant that most people were flea-infested and hence that diseased fleas would have little trouble in finding and

[13] J. F. D. Shrewsbury, *op. cit.*, p. 53.

[14] Will Durant, *The Age of Faith*, New York, 1950, p. 642; Henri Pirenne, *Medieval Cities*, New York, 1956.

feeding upon human hosts. The third time factor was probably the rise of Saracen power, which drastically restricted commercial intercourse between Indian and medieval Europe and which also imposed what might be called a personal hygiene barrier between the two regions. Finally, the invasion of Europe at the beginning of the eighteenth century by *Rattus Norvegicus* and his ecological victory over the black rat cut off a link in the chain of propagation and ended the threat of bubonic plague to the peoples of Europe.

CLASS IMPACT OF THE PLAGUE

From a class standpoint, the great brunt of the mortality of the Black Death fell upon the shoulders of the poor.

Throughout Europe, a very large proportion of the poor lived in mud or wattle-and-daub huts, roofed with straw or thatch. People slept either naked or in their clothes on the floor of hard earth or else on trestles covered with straw. The house rat with its flea parasites would make its home in burrows under the earthen floor or else in the thatch roofs, emerging from its dark hiding places at night. Plague-carrying *cheopis* fleas would drop from the infected rats in the roofs to the human beings sleeping below them. Since the latter were huddled together, the insects could move from one human host to the next.

In the towns, living conditions were little better, but the roofs were less frequently of thatch and, to that extent, the danger of contagion was narrowed.

The situation of the nobles was entirely different:[15]

> The stone-built castles with their resistant walls and unfriendly roofs, and the manor houses with their moats would also be uncongenial to it (*Rattus rattus*). There is nothing surprising therefore about the almost complete exemption of the English nobility and landed class from "The Great Pestilence;" it just happened that the house rat could not make itself at home in their castles, "peel towers," and manor houses. The brick-built house with its slated or tiled roof was also inimical to it, and the national development of this type of building was probably the most important single factor in the eventual disappearance of the house rat from the bulk of England.

The class-limiting factor was the rat, not the flea. All classes in English society were verminous. As for privacy, "Hoccleve writes of an earl and countess, their daughter and their daughter's governess who all slept in the same room.[16]" For them to have slept in the same bed would not have been remarkable

[15] J. F. D. Shrewsbury, *op. cit.*, p. 35.

[16] Philip Ziegler, *op. cit.*, pp. 151-152.

and, had they been impoverished, to lack even the bed. The fleas however, could not spread bubonic plague in dwellings impervious to the black rat.

Regional differences also affected the impact of the Black Death. In England, the great importance of the wool trade meant that a staple was produced and transported in bulk in the bales of which *Rattus rattus* could readily lodge. Building materials varied from region to region and, throughout almost the entire Mediterranean area, a chronic shortage of lumber affected housing. But to analyse the possible effects of these local, national and regional differences would take us far afield.

There is a general consensus that the nobility escaped the worst of the disaster. "Many writers inveighed against the flight of the rich," Nohl wrote, "which gave rise to ill-feeling among the poorer classes. Nearly all reports of contemporaries agree in stating that the plague claimed most of its victims among the poor and badly nourished, for whom, as Simon de Couvino says, life itself was a kind of death. This bitterness was carried so far that the people in various towns of Italy believed that the plague had been artificially caused by the rich. . . . More than once it is reported that the raging peasant roasted noblemen in the presence of their wives and children, and then forced the wives to eat their flesh and ultimately murdered them after the most brutal violation."[17]

As for the intellectuals, we have some information—and a good deal of misinformation—concerning the havoc wreaked at Oxford and Cambridge. Archbishop FitzRalph, who had been Chancellor of Oxford before the Black Death, wrote in his *Defensorium Curatorium* (1357) that the student population of Oxford had been cut down from 30,000 in his day to 6,000 after the pestilence had disappeared.[18] Every responsible historian of the plague has characterised this assertion as typical of medieval statistical irresponsibility since the town of Oxford could not possibly have housed anything approximating 30,000 students.[19] George Deaux concludes "that the students were no more fortunate than any other group in avoiding the plague and that between a third and half of them were very likely carried off by it."[20] In Shrewsbury's judgment, there are few actual records of deaths at Oxford University, which is "not strange in view of later records that at both Oxford and Cambridge the masters and

[17] Johannese Nohl, *The Black Death, A Chronicle of the Plague Compiled from Contemporary Sources,* London, 1926, 1971, pp. 94-95, 98.

[18] George Deaux, *The Black Death 1347,* London, 1969, p. 133.

[19] George Deaux, *op. cit.,* pp. 133-134; J. F. D. Shrewsbury, *op. cit.,* p. 81; G. G. Coulton, *The Black Death,* London, 1929.

[20] George Deaux, *op. cit.,* p. 134.

scholars immediately fled into the country at the first hint of plague. . . .[21]"

The town of Cambridge, together with the London area, had the unenviable distinction of being one of the worst centers of plague mortality in England. The mortality rate was estimated to be 5 per cent of the total population. However, the academic authorities had the good sense to order the University closed during the worst period of the pestilence and it can be assumed that faculty and students departed to healthier places.

The wealthier, the better educated, the more powerful and the more intelligent were better able to avoid death from bubonic plague, as a rule, than more ordinary people. Some, like Pope Clement VI at Avignon, would seek to isolate their dwellings from intrusion by people who might prove to be infected. Others, like Boccaccio, would leave the cities for safer places in the countryside.

This relative immunity did not, however, affect all the professions and callings which were attractive to the educated, the rich and the powerful. When universities neglected to close their doors during a plague epidemic, their faculty and students were placed at an abnormally high risk. In fact, any institution which kept large groups of people in close physical proximity to each other exposed them to pneumonic infection, which spreads directly from one human being to another and is almost invariably fatal. This danger applied to students and faculty in lecture halls and classrooms; to soldiers in encampment and bivouac, and to monks and nuns. An even greater danger of infection from pneumonic plague faced those priests, physicians and nurses who attended the sick and the dying.

We have a good deal of statistical evidence concerning the deaths among beneficed clergymen and these figures are more reliable, particularly where they are English, than any other quantitative data on plague mortality we possess.

One of the most astonishing estimates, based primarily on German data, is that "at least 35 per cent of the higher clergy" died of the plague.[22] Protected by their power and authority and seldom in close personal contact with their parishioners, these ecclesiastics were in a much better position to avoid infection and death than the population at large.

Fairly sophisticated studies of clerical records in 10 English dioceses show that the death rates among beneficed clergy ranged from 39 per cent for York to 49 per cent for Exeter, Winchester and Norwich.[23]

[21] J. F. D. Shrewsbury, *op. cit.*, p. 81.

[22] Philip Ziegler, *op. cit.*, p. 85.

[23] Philip Ziegler, *op. cit.*, p. 228.

These figures seem extraordinarily high. The priests were better educated than the general population. They were more likely to live in stone dwellings largely impervious to rats. With higher standards of personal hygiene, they were less likely to be flea-infested or to live in rat-infested dwellings. They had greater mobility than most Englishmen. Their households probably were, on average, smaller and certainly offered more space per person. They were also considerably older than the average of the English population, a fact which non-medical historians of the plague assume "meant that, in any given year, a higher proportion of priests were likely to die,"[24] but which medical authorities assert would have the opposite effect.[25]

Shrewsbury suggests that the mortality figures reported for beneficed clergymen exaggerate the true state of affairs, since they include large numbers who fled their parishes and abandoned their calling. It is true that, throughout Europe, monastery after monastery was abandoned. An alternate explanation is that the great majority of beneficed clergymen carried on with their duties, comforting and giving absolution to the dying. The performance of these tasks would have made them peculiarly susceptible to death by the plague in its pneumonic form.

MASSACRES OF GERMAN JEWS

Another vector in the complex of forces which defined the direction and the impact of the Black Death on ability and intelligence is the massacres of the Jews which accompanied and followed the pandemic. These massacres occurred primarily in Germany, where Jewish community after Jewish community was burned to death or otherwise exterminated. Some of these Jewish communities dated back to their foundation by Jewish prisoners of war deported to Germany by Titus after the fall of Jerusalem in 70 A.D.

The ignorant mob became convinced that the Jews had caused the plague by poisoning the wells. Under torture, Jews were made to confess to this and other crimes. As a matter of fact, the Jewish communities avoided the wells, which were generally contaminated with sewage, and took care to obtain and drink pure water. However, since bubonic plague is not a water-borne sickness, this had nothing to do with the superior Jewish rate of

[24] Philip Ziegler, . cit., p. 128.

[25] J. F. D. Shrewsbury, *op cit.*, writes that Russell's "third observation is that the plague mortality rate among the beneficed clergy was higher than among the inquisitions group, which he suggests is explicable on the supposition that 'the clergy were probably far older on an average than this group and thus subject to a higher mortality', whereas modern knowledge of the disease indicates that they would have suffered less from the disease" (p. 51). The "inquisitions group" refers to 500 post-mortems performed during the period, from which the plague historian J. C. Russell derived an overall English mortality rate of 27.3 per cent, which he later—and probably erroneously—reduced to 23.6 per cent.

survival. If the Jewish morbidity and mortality rates during the Black Death were lower—and this is by no means firmly established—the probable reason was their superior standards of cleanliness, their avoidance of vermin and rodents, and the fact that their dwellings were more impervious to the house rat than those of their non-Jewish neighbors.

Nohl points out with reason that these "deeply revolting" massacres of the Jews "were perpetrated exclusively on the tempestuous urging of the populace". The ruling classes and the educated minority knew that the accusations were baseless, "but from fear of the rabble and still more for the sake of material profit, not only held their peace, but in the most cruel manner participated in the slaughter of the innocent victims".[26] Clement VI, an Avignon Pope and a civilized and cultivated man of the world, not only condemned the massacres, but threatened those Christians who participated in them with excommunication.

The estimates of the numbers of Jews burned to death and otherwise slaughtered in German towns during the Black Death are probably not much more reliable than other medieval quantitative data. One historian sums it up by stating that 60 large and 150 smaller communities were probably exterminated and 350 massacres occurred.[27] A large number of the survivors fled to Poland and Lithuania where they found new homes.

The aristocidal significance of these massacres of German Jews was undoubtedly enormous. Over 10 years ago, Dr Stefan T. Possony and I used George Sarton's *An Introduction to the History of Science* to estimate the comparative contribution of various nationalities, ethnic groups, religions and regions to medieval science.[28] We found that of all the scholars, philosophers and scientists listed by Dr Sarton, 15.0 per cent were Jews in the thirteenth century and 10.9 per cent were Jews in the fourteenth century. World Jewish population was estimated at two millions in 1200 A.D. by Dr Salo Wittmayer Baron in his classic history of Jewry. This compared to a European population, according to Beloch and Carr-Saunders, of between 35 and 59 millions. Thus, the Jewish contribution to the intellectual life of the medieval world was proportionately much greater than that of Europeans in general, despite the disabilities, harassments, persecutions and massacres from which the Jews almost continuously suffered.

In conclusion, the Black Death represented such a *melange* of conflicting forces for differential mortality or survival that it is difficult to judge whether it was aristocidal in its net effect or the

[26] Johannese Nohl, *op. cit.*, pp. 116, 114.

[27] Philip Ziegler, *op. cit.*, pp. 108-109.

[28] Carnegie Institute of Washington, Washington D.C., 1927-47, three volumes.

reverse. It bore down most heavily on the coastal regions, the seaports, and the Mediterranean centers of high civilization. It scourged the cities, where the ablest, the best educated, the brightest and the best of the population tended to congregate. In the rural areas, it was probably most severe in regions with good soils, comparatively prosperous peasantries and hence higher-than-average density of population.

In general, the Black Death spared the rich and smote the poor. The well-to-do, the educated, the intelligent and the powerful were able to flee the plague cities to the countryside, where many idled on their estates until the danger had passed. Others diminished the risk of contagion by isolating themselves within their town residences. On the other hand, mortality was probably very high among the physicians who attended plague victims. That portion of the literate minority which was cooped up either in monasteries, nunneries or universities faced greater than average risk, from pneumonic plague at least, unless they had the practical sense to flee or their superiors were pragmatic enough to close their institutions. According to all the statistics available, the parish priests suffered inordinately. It seems safe to conclude that in England at least 40 per cent and perhaps 50 per cent of this quantitatively significant element perished during the Black Death. Finally, the massacre of German Jewish communities and anti-Jewish atrocities of lesser importance elsewhere added a new aristocidal component to what was perhaps the greatest single catastrophe ever visited on the human race.

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The Gene's Place in Revolutionary Adaptation

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PREFACE

This is a critical review of the premises on which the present-day Mutation-Selection ("synthetic") Theory of Evolution rests.

This theory started from an attempt to explain the origin of species in terms of universal lineal descent and has become, eventually, environmental to such an extent as to be hardly discernible from the milieu theory of historical and dialectic materialism as expounded by F. Engels, the life-long companion of Karl Marx, in *The Dialectics of Nature.*

The extent of this far-reaching transformation becomes apparent when one compares what education as a means of improving the human species meant to Humboldt, a humanist in the footsteps of Erasmus of Rotterdam, on the one hand, and the humanitarian Dobzhansky on the other. To Humboldt, education was equivalent to ennobling *(Veredelung)* man *in his individuality.* For Dobzhansky, educability, that is, the ability "to adjust one's behaviour to circumstances in the light of experience," is the diagnostic character of the human species, due to its human evolution. This premise leads Dobzhansky to conclude that anyone lacking educability is a pathological individual, a "misfit," hardly to be called human.

For environmental theory, the origin of adaptation, that is, adjustment to prevailing environmental conditions, is the prime problem in evolution. Adaptation is the result of natural selection, meaning the sum of all influences exerted by the environment, living and inanimate alike, on the organism. "The organism is adapted to the environment and not *vice versa*" (G. G. Simpson). Thus, we have a causal (and temporal) relationship though causation is indirect via differential reproduction.

This leads to an alternative: what is adaptive, namely in the direction of evolution, is equivalent to selected, meaning brought about by the environment, in terms of favoured gene complexes; and, conversely, what is not selected is identical with "random." It is an extraordinary fact, says Simpson, that most processes inherent in the genetic mechanism of evolution occur at random. Consequently, selective theory starts from a "gene chaos" and leads to niche specifity: when each species has its niche, and each

* My thanks are due to Dr C. Wallace, Johannesburg, for fruitful discussions on chromosomal analysis, and to Dr R. Gayre of Gayre and Professor Raymond A. Dart who both read the manuscript and offered most valuable suggestions.