elementary subjects has so quickly become out of date. In the "Encyclopaedia Britannica" (1938) it is stated under the entry "Number" that "the concept of ordinary number was first adequately presented by Euclid." The treatment of the development of number systems and the representation of real numbers by limiting processes in the parts of this revised volume which have appeared indicate wide digressions from Euclid in the modern development of concept of ordinary or positive numbers. The fact that the ancient Greeks commonly restricted the notion of number to discontinuous magnitudes is of fundamental importance in the history of mathematics and must be clearly understood in order to evaluate the contributions made by recent mathematicians towards our present concept of number.

The revised volume to which we referred above enables the German mathematicians to retain now the leading position among the mathematicians of the world with respect to mathematical encyclopedias, even if it omits a number of the important subjects, including the theory of probability, which were treated in the first edition. It also includes some subjects, such as mathematical logic, which were not explicitly treated in the first edition but constitute a welcome addition in this revised volume. The number of references is large, but in view of the great extent of the recent literature they do not aim to be complete. A wise selection of references is very useful to the beginner in a field of mathematical study in these days of intense specialization when too little is frequently left to be supplied by the reader who enjoys to supply the obvious.

Recently the American mathematicians started a periodical under the title of *Mathematical Reviews,* which may bring to our country an important share of the reviewing of the current mathematical literature of the world and thus arouse a greater interest in the mathematical advances of the present time. Heretofore the German mathematicians have been especially prominent along this line. They established in 1871 a review journal entitled *Jahrbuch über die Fortschritte der Mathematik,* which has been published fairly regularly since then and is widely used wherever mathematical advances are successfully made in a rapidly widening list of countries. In 1931 they established a second somewhat similar periodical under the title *Zentralblatt für Mathematik* with a view to bringing reviews to the attention of the public more promptly than was done earlier. The recent American periodical along this line will therefore have considerable competition, but it has started out in a promising manner and will probably receive strong support, especially in America.

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THE CHESTNUT BLIGHT AND ITS RELATION TO THE PRINCIPLE OF DISEASE RESISTANCE

CADMUS' adventure with the slain dragon's teeth that sprang anew into life forms an allegory of the American chestnut, *Castanea dentata* Borkh. Consigned to rapid extermination and a place with the dodo as an extinct species after discovery of the disease in the Bronx in 1904, the chestnut perennially springs into life and is still a familiar species of our woodlands, its foliage adding to the lower-story canopy of the summer forest and its wood and bark providing a habitat for associated species.

Data collected on survival of the American chestnut were published in this journal[1] some years ago, and private research again makes possible a picture of the present blight situation. Permanent plots were laid out in the earlier days of the research, carefully charted and each tree measured, the increase in length of every stem and twig of each tree for each growing season being recorded as cm increment of growth. The lengths of stem and twig killed by blight the same year were recorded in like manner. It was found in 1926, when the last report was published in SCIENCE, that the ratio of new growth produced to blight-killing in the year 1926 was as 3 to 1. The plots have been remeasured in 1939 and the ratio, while varying widely with soil and plot history, is again favorable, the average for all plots tallied being better than 2 to 1. As the trees grow older the total volume of increment naturally increases: thus, Table 1 shows the growth increment for one plot.

TABLE 1

TOTAL GROWTH INCREMENT FOR PLOT 3, EXPRESSED IN TERMS OF CM LENGTH EXTENSION OF TWIG AND SHOOT

1926—1,431 cm	1929—4,456 cm
1927—1,812 cm	1930—5,681 cm
1928—3,092 cm	1939—8,092 cm

Our study has brought to light several noteworthy facts. First, stump sprouts have very little resistance to blight, and the rapid destruction of their coppice has doubtless led to the popular belief that the chestnut is being exterminated. On the other hand, seedlings have proved highly resistant, and many of the seedlings on our plots have come through the fifteen years of our observational study untouched or but slightly touched with blight. Moreover, several new seedlings have appeared on our plots and have reached a height of from 1 to 3 m in the period of our study. The seed trees earlier recorded in SCIENCE are still fruiting and are apparently responsible for at least one healthy seedling that appeared in Plot 2. There are several enemies of the seedlings, however, which now appear almost as inimical as the *Endothia:* Hunters do a sur-

[1] SCIENCE, 60: 292–293, 1924; *ibid.,* 63: 476–477, 1926; *ibid.,* 70: 538, 1929.

prising amount of damage by inflicting gunshot wounds on saplings. A number of our seedlings bore such wounds and in some cases blight had evidently entered through the wound. Rabbits are very destructive to small sprouts and tender shoots which they shear off. Our Plot 4 had been browsed by deer. Plot 5 had suffered from fire, while Plots 1 to 4 had been ravaged by man. But chiefest enemy of chestnut is shading, for seedlings endure shade only with difficulty, while stump sprouts quickly dwindle and disappear. The best thing that can now be done for chestnut is to give it a careful release cutting; and wherever this has been done the chestnut shoots into rapid and healthy growth.

The question now arose as to why vigorous seedlings should be resistant to blight and why sometimes the chestnut is able to heal the cankers and continue living. It occurred to the writer that the chestnut canker might be comparable to the fungus-root or mycorrhiza. In both cases a higher plant is attacked by a fungus and in both the higher plant can resist the fungus. In the mycorrhiza the fungus penetrates to a certain distance within the root tissues, then coils, forms twig-like or spore-like structures, breaks down and is evidently absorbed by the root-cell with accompanying increase in size and stainability of the host nucleus. The writer collected diseased and healed cankers of the chestnut, sectioned them and studied them under the microscope. The diseased cankers were found to contain abundant mycelium penetrating freely through the tissues. The healed cankers, on the contrary, showed limitation of the fungus and there were all stages in the breaking down of the fungus with formation of typical "digestion cells" and enlarged host nuclei exactly as in the mycorrhiza. Apparently the resistance of the root to the fungus which results in a swollen mycodomatious organ is exactly the same sort of thing as the resistance of the chestnut stem which results in a swollen fungus-digesting knot on the stem.

We were next interested in the question of how the host limits the fungus. Why are some cankers healed while others are lethal? The problem again appears paralleled by the mycorrhiza: We know that the mycorrhiza is an organ of "mutualistic symbiosis" only when the host is growing vigorously, but that the fungus may become a parasite if the host's vigor is lessened. We know, moreover, that in any given species the fungus *always penetrates to a given depth* within the host tissues. In some species it penetrates only the epidermis, in others the outer cortex, in still others the mediocortex; but the central cylinder is never invaded and is usually not too closely approached. We know, too, that the central cylinder is the region of "food" transport and from the central cylinder elaborated materials pass outward toward the exterior of the root, being diluted by materials passing inward from the soil. Without having experimental data to support his idea, the writer believes that the osmotic coefficient for sap in the central cylinder is greater than that of the outer tissues of root or stem, and that the osmotic pressures decrease progressively toward the exterior. The writer suggests the following hypothetical picture of the relation of fungus to host as dependent on a balancing of osmotic pressures. As long as the fungus can maintain a higher osmotic pressure than the host sap it encounters, it penetrates into the host tissues; but whenever it encounters a higher osmotic pressure it is broken down and absorbed by the host cell. We know as a fact that this breaking-down process and "phagocytosis" occurs in a definite region in any specific mycorrhiza and we may suppose that it is to that region the elaborated materials have filtered from the central cylinder in sufficient quantity to raise the cortical ionic concentrations enough for them to break down the fungus. The pelotons, arbuscles, sporangioles, etc. of the mycorrhiza would then appear to be simply the pathological developments of hyphae in an unfavorable environment, just as the root hair will form curious knottings, etc. (even breaking down) when placed in an unfavorable ionic concentration. In the chestnut, the resistant canker is one possessing osmotic values great enough to overbalance the fungus. Resistant seedlings are those of healthy vigorous growth with salt-rich sap. Dying stump-sprouts are killed because the root systems are not able to retain their vigor after the tremendous major operation caused by removal of the large tree which formerly supported them.

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THE "BABOON BOY" OF SOUTH AFRICA

PERIODICALLY, for more than a decade, the South African as well as European and American presses have carried reports regarding a native South African boy nurtured by baboons. Relatively convincing evidence establishing the authenticity of the case has just become available for the first time, largely due to the offices of Dr. Raymond A. Dart, professor of anatomy at the University of the Witwatersrand, Johannesburg, South Africa, to whom the writer is indebted for a copy of the original documents relating to the case.

The data seem to indicate that the boy was discovered in 1903 by two troopers of the Cape Mounted Police. Coming across a troop of baboons playing in a clearing in a remote part of the South East Cape, they fired into the group, and were surprised to notice that one animal who was not as fast as the others was left behind. The laggard was caught and found to be a native boy between 12 and 14 years of age. The boy