The present position seems to be as follows: (i) Elementary particle theory indicates a complete symmetry in the production of particles and antiparticles. (ii) It is generally argued that we live in a universe of matter alone because great annihilation energy would be observed if appreciable antimatter existed and there were no segregation mechanism. (iii) "Antigravity" segregation would not be consistent with the general theory of relativity.

General approaches to the question of the coexistence of matter and antimatter on a large scale in the universe have been two. First, the general theory of relativity is given preference over the symmetry of production of matter and antimatter (*6*), and (ii) is accepted. A second approach has been to assume that the production of matter and antimatter is—and was at every epoch—symmetric, but that annihilation is prevented by a segregation mechanism. A statistical fluctuation segregation mechanism has been considered by Goldhaber (*1*) but a further analysis does not support it (*7*). A second segregation mechanism considered by Goldhaber is that of an initial segregation through decay of a self-conjugate universon into a cosmon and an anticosmon which were the precursors of our universe and an unobservable antiuniverse (*1*).

Still another proposed segregation mechanism is that of "antigravity," whereby it is supposed that there is mutual repulsion between matter and antimatter and mutual attraction between all bodies of the same type matter (*3*, *4*, *8*). Morrison (*4*) considers a mixture of the two types of matter interacting in this way and calls such a mixture a gravitational plasma.

The purpose here is to discuss an evolving cosmological model based on matter-antimatter symmetry and antigravitational segregation. While general relativity may be supposed valid in any region occupied by one type matter alone (*3*), it would not apply to the gravitational plasma as a whole; therefore, a Newtonian system will be considered (*9*). The basis of this model is a "neutral" gravitational plasma in which the bodies all have the same inertial mass at any epoch; it is assumed that the bodies may grow by aggregation or agglomeration.

In the first place, it has been noted that a gravitational plasma has properties which are significantly different from those of an electric plasma (*4*). Besides these we consider that each charged body in a neutral electric plasma has a positive binding energy because the dominant interaction is with its nearest neighbors, to which it is attracted. On the other hand, in a "neutral" gravitational plasma each body is repelled by its nearest neighbors and possesses a negative binding energy. Thus, besides being unstable to segregation and aggregation, a neutral gravitational plasma is unbound.

From these considerations, a gravitational plasma universe, of itself, flies apart. It is tempting to associate this unbinding with a cosmic repulsion (*10*) leading to recession of the galaxies. Consider a Newtonian gravitational plasma spherically symmetric about an origin of coordinates (*9*). For all epochs, the concentrations of matter and antimatter will be supposed equal in the large. For simplicity we do not consider the detailed internal dynamics of the plasma but, as usual, assume the interior of the sphere to be uniformly filled with the plasma. The kinetic pressure is also assumed to be zero. If we follow these assumptions, and neglect velocity dispersion at the boundary (*11*), the evolution of the plasma is described by the radial motion of the boundary bodies. The bodies on the boundary experience a net radial force and a radial acceleration. If, for ease of computation, the bodies are assumed to be distributed regularly on a three-dimensional cubic lattice, the radial acceleration of a boundary body is (*12*)

$$\ddot{R} = C\frac{m}{a^2} = C\left(\frac{3M}{4\,\pi\,m}\right)^{\frac{2}{3}}\frac{m}{R^2} = C\left(\frac{3M}{4\pi}\right)^{\frac{2}{3}}\frac{m^{\frac{1}{3}}}{R^2} \qquad (1)$$

where C is a constant, m is the body inertial mass, R is the plasma radius, and M is the total inertial mass. This assumes that R is much larger than the body separation or 'lattice parameter," a.

On this basis one might visualize the evolution of this model as follows. At the beginning of the expansion the finite radius gravitational plasma universe is at rest relative to the coordinate origin and is in a state of relatively high density and low aggregation (small R, small m). Because of the small body mass, m, the plasma expands very slowly—resembling a slow expansion from a static Einstein universe—the rate of aggregation effectively controlling the expansion. Aided by instability against segregation and aggregation (*4*), stars and antistars are formed while over-all neutrality is maintained by the randomness of aggregation sites.

As aggregation proceeds, m and R increase, and acceleration of the expansion proceeds as a competition between aggregation and expansion dilution. The expansion is always accelerated, however, and after a sufficiently long time the gravitational plasma universe is flying apart at a high rate and all bodies are receding from any body well inside the plasma (*9*).

For such a model universe, departure from a smoothed-out universe forms an essential part of its dynamics; an ideally smoothed-out universe of this type would expand only through annihilation radiation or an initial radial velocity. Another important feature is that the expansion time scale is not independent of the aggregation time scale.

An interpretation which might be made is that the present epoch in our universe is to be identified with the epoch in this model universe at which clustering of galaxies and of antigalaxies has taken place, but at which there is yet no appreciable clustering of clusters and of anticlusters (*13*).

This is admittedly very hypothetical, but on the other hand there are observations interpreted by some (*14*) to indicate an apparent noninteraction of clusters which might be understood on the basis of such a model.

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10. This cosmic repulsion is of a different nature from the usual cosmic repulsion in that it does not vary directly with radius and in that it depends on boundary effects.
11. The boundary would actually be unstable against velocity dispersion to some degree.
12. Equation 1 can be obtained from a calculation at the boundary similar to a Madelung constant calculation or by considering the negative binding energy to result in a pressure which accelerates the boundary matter. From the latter, the constant $C = G_{\alpha}/3$, where G is the gravitational constant and α is the Madelung constant.
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Observations on the Sexual Stage of Colletotrichum orbiculare

Abstract. An isolate of the fungus *Colletotrichum orbiculare* (syn. *C. lagenarium*) race 1 that forms perithecia in culture was isolated from edible gourd in North Carolina. This isolate has been identified as a species of *Glomerella*. The isolate produces very few ascopores when selfed; however, ascospores are produced in abundance when mated with certain other isolates of *C. orbiculare*.

An isolate of the cucurbit anthracnose fungus *Colletotrichum orbiculare* (syn. *C. lagenarium*), originally cultured in 1959 from edible gourd, variety Cucuzzi, (*Lagenaria leucantha* var. *longissima*) in North Carolina, has formed the perfect stage when the cultural techniques for mating fungi described by Nelson (*1*) were used. Perithecia contained very few mature ascospores when selfed, although when they were paired in combination with certain other isolates of *Colletotrichum orbiculare*, ascospores were produced in abundance. Progeny ascospore isolates also produced fertile perithecia. Pathogenicity studies with the original isolate and with ascospore progeny cultures indicated that the gourd isolate is of the type described by Goode (*2*) as *C. orbiculare* race 1.

The sexual stage of *C. orbiculare* has been reported previously only twice. Stevens (*3*) induced cultures of *C. orbiculare* to produce perithecia by the use of ultraviolet radiation. These perithecia contained asci but did not form mature ascospores. He described this perfect stage as *Glomerella lagenarium*. Because Steven's isolate did not form mature ascospores, the proposed name *G. lagenarium* for the cucurbit anthracnose fungus has not been generally accepted. Watanabe and Tamura (*4*) observed perithecia in cultures of an anthracnose fungus isolated from infected cucumber (*Cucumis sativus*) leaves. They named their isolate *Glomerella lagenaria.* In a monographic study of the genus *Colletotrichum,* von Arx (*5*) considered *C. orbiculare* as a specialized conidial form of *Glomerella cingulata.* Von Arx also showed that the specific name *Colletotrichum lagenarium* (the binomial used almost exclusively in the literature) was improper. After reviewing the papers of Berkeley (*6*), we agree with von Arx that the taxon *C. orbiculare* has priority for the asexual form of this fungus.

The perfect stage of the North Carolina isolate has been identified as a species of *Glomerella.* Preliminary comparisons of the North Carolina isolate with the isolate of Watanabe and Tamura and with several isolates of *Glomerella cingulata* have been made. The North Carolina isolate of *Glomerella* differs from *G. lagenaria,* as described by Watanabe and Tamura, in growth rate, colony morphology, presence of setae, conidial color, and pathogenicity. The only similarities are in conidial shape and size. Morphologically the sexual stages of both organisms fall into the broad description given for *G. cingulata.* However, the exact taxonomic relationships of these isolates have not been established. Studies are in progress to clarify the taxonomic position of the North Carolina isolate of *Glomerella* and to determine its genetic relationship to the previously described races of *Colletotrichum orbiculare* (*C. lagenarium*) (*7*).

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Evoked Cortical Potentials in Absence of Middle Ear Muscles

Abstract. Evoked potentials to click at auditory cortex were recorded from cats deprived of middle ear muscles. Variations in the amplitude of the response after surgery indicate that the participation of these muscles in habituation, conditioning, and distraction must be minimal.

Lability of evoked potentials to auditory stimulation has been demonstrated at various auditory and nonauditory loci in habituation, conditioning, distraction, and extinction (*1*). It has also been demonstrated that middle ear muscle action not only contributes to sound attenuation at the periphery of the auditory mechanism—for example, at cochlear round window (*2*)—but that these muscles may and do participate in central phenomena such as conditioning (*3*).

Hernández-Péon *et al.* (*4*) showed that electrical responses to clicks in the dorsal cochlear nucleus of the cat are depressed during attentive behavior. They attributed this attenuation to a reticular influence which controls sensory transmission at the first synapse, presumably by way of efferent paths.

Hugelin *et al.* (*5*) took exception to this neural mediating mechanism and suggested that the lability observed at the cochlear nucleus may be adequately explained by contractions of middle ear muscles. They showed in the curarized "encéphale isolé" cat (muscles inactivated) that reticular stimulation has no effect on the amplitude of the dorsal cochlear nucleus response to click. Furthermore, in normal cats deprived of middle ear muscles on one side, reticular stimulation attenuated cochlear nucleus potentials on the normal but not on the operated side. From this they suggest that the middle ear muscles are responsible for the amplitude reduction at cochlear nucleus in the normal cat.

The present study was undertaken to determine whether evoked potential lability at the auditory cortex of normal cats could be entirely accounted for by middle ear muscle contraction. Four

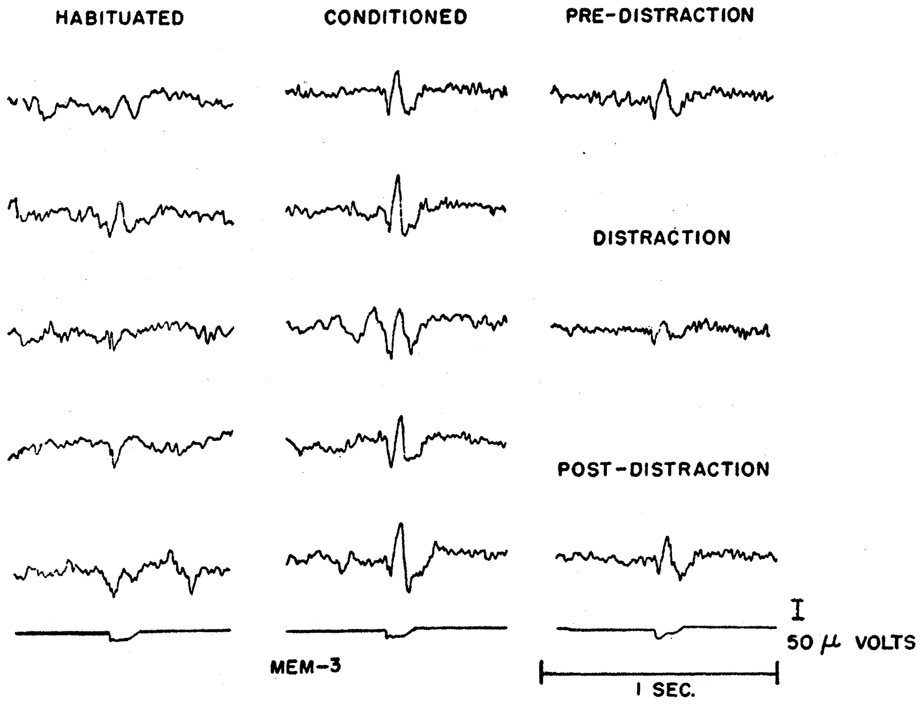

Fig. 1. Electrical responses to click at auditory cortex during habituation, conditioning, and distraction.