Business and labor are not backward in presenting their opinions on social questions that affect them. They make sure that in the final decision their views have been considered. There are many who think that the viewpoint of scientists should also be stated publicly. In fact, if others express their opinions and scientists do not, a distorted picture will be presented, a picture in which the importance of science will be lacking and the democratic process will become to that extent unrepresentative.

The need for action is serious and immediate. Consider, for example, the situation related to the biological hazards of radiation. It is now 6 months since the radiation committees of the National Academy of Sciences issued a report that called for a series of immediate actions including, among others: (i) the institution of a national system of radiation exposure record-keeping of all individuals; (ii) vigorous action to reduce medical exposure to x-rays; (iii) establishment of a national agency to regulate disposal of radioactive wastes; (iv) establishment of an international program of control and study of radioactive pollution of the oceans; (v) considerable relaxation of secrecy about dissemination of radioactivity. In addition, the committees pointed out that "The development of atomic energy is a matter for careful integrated planning. A large part of the material that is needed to make intelligent plans is not yet at hand. There is not much time left to acquire it."

There is no evidence that these urgent pleas for action have yet met with any significant response. Clearly, this is a matter that requires the persistent attention of all scientists. It exemplifies the pressing need that scientists concern themselves with social action. In this situation, the AAAS carries a special responsibility. As one of our past presidents, Warren Weaver, has said: "If the AAAS is to be a vigorous force for the betterment of science, it cannot continue in the face of crucial situations with closed eyes and a dumb mouth." This responsibility has already been recognized. What is needed now is a way to meet it.

Humble Oil Company Radiocarbon Dates I

H. R. Brannon, Jr., A. C. Daughtry, D. Perry, L. H. Simons, W. W. Whitaker, Milton Williams

The radiocarbon ages given in Table 1 were determined by the geochemical research group of the Production Research Division, Humble Oil and Refining Company. The method used, which has been described in a previous publication (*1*), was proportional counting of carbon dioxide that had been prepared from the sample under assay. The counter was filled to an absolute pressure of 5 atmospheres of carbon dioxide in all cases.

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The ages are based on a half-life of radiocarbon of 5568 ± 30 years (*2*) and on an assay of contemporary carbon, whether in the form of organic carbon or of calcium carbonate, of 20.27 ± 0.15 count per minute for the particular counter used. This value was obtained by the extrapolation to zero age of assays of tree rings greater than 50 years in age. Background counting rates were in the neighborhood of 5 counts per minute, with a statistical uncertainty of ± 0.07 count per minute.

The samples described in the table were obtained from sites that have been studied primarily for obtaining archeological information. However, since the stratigraphic relationships of a number of the sites in the lower Mississippi Valley have been developed, the radiocarbon ages of the archeological samples contribute not only to the archeological history, but also to the development of an absolute chronology of sedimentary events in the region.

References

1. H. R. Brannon, M. S. Taggert, Jr., M. Williams, *Rev. Sci. Instr.* 26, 269 (1955).
2. W. F. Libby, *Radiocarbon Dating* (Univ. of Chicago Press, Chicago, Ill., ed. 2, 1955).

Table 1. Radiocarbon dates obtained on archeological samples. All ages are given in radiocarbon years before the present.

Description	Sample No.	Age (yr)
Manny site, Issaquena County, Miss. Sample from a deposit that consisted largely of carbonized fragments of cane (*Arundinaria macrosperma,* identified by E. S. Barghoorn, curator of paleobotany, Harvard University). From cut C, − 23 to − 43 cm, uppermost stratum. Should date the Coles Creek phase. Collected 20 April 1954. Submitted by Phillip Phillips and Robert E. Greengo, Peabody Museum, Harvard University.	O-12 O-23 O-27	1130 ± 100 980 ± 100 1080 ± 100 Average 1050 ± 100
Thornton site, Issaquena County, Miss. Sample from a deposit of carbonized cane and wood about 22 cm in diameter. From cut C, − 140 to − 158 cm. Should date the Issaquena phase. This is a regional phase in the lower Yazoo Basin that probably falls within the Troyville period as defined by James A. Ford, American Museum of Natural History, and others. Collected 2 March 1954. Submitted by Phillip Phillips and Robert E. Greengo.	O-24	1410 ± 100
Thornton site, Issaquena County, Miss. Sample from a deposit of carbonized materials, about 22 cm in diameter, including a greater proportion of wood than that tabulated under sample O-24, but otherwise similar. From cut D, − 128 to − 141 cm. Physical stratification good. Should date the Issaquena phase. Collected 3 March 1954. Submitted by Phillip Phillips and Robert E. Greengo.	O-25	1420 ± 100

Description	Sample No.	Age (yr)
Thornton site, Issaquena County, Miss. Sample from a deposit of carbonized materials, mostly carbonized wood, 19 by 26 cm in cut E, − 130 to − 140 cm. Apparently from a large pit intrusive to this deposit from uppermost strata. The associated material is either Coles Creek phase or mixture of Coles Creek and Issaquena phases. Collected 16 March 1954. Submitted by Phillip Phillips and Robert E. Greengo.	O-26	1180 ± 100
Manny site, Issaquena County, Miss. Sample from a deposit of carbonized cane 28 cm in diameter from cut W, − 140 to − 160 cm. Deposit was found in dark, brown-stained clayey silt (sterile natural levee) some 15 cm beneath the lower midden stratum, from which this deposit appears to be intrusive. Should date the earliest occupation (Issaquena) in the excavation area. Collected 15 April 1955. Submitted by Phillip Phillips and Robert E. Greengo.	O-143	1260 ± 100
Manny site, Issaquena County, Miss. Sample from a deposit of carbonized cane 45 cm in diameter, cut U, − 128 to − 146 cm (sample from bottom 6 cm), at the bottom of the lower midden stratum. Should date the Issaquena phase. Collected 29 April 1955. Submitted by Phillip Phillips and Robert E. Greengo.	O-145	1100 ± 100
Manny site, Issaquena County, Miss. Sample from a carbonized cane deposit in cut AA (in top center of mound A, a rectangular mound 4 m high). From − 172 cm. Deposit is in a matrix of olive-brown, silty clay (mound loading). This cane deposit is most likely related to an occupational level or incipient soil profile demarked by a band of charcoal flecks and ash some 5 to 10 cm thick at − 150 cm. The few sherds recovered in this cut are mostly Issaquena, but they may have been scraped up from an earlier midden. Collected 24 April 1955. Submitted by Phillip Phillips and Robert E. Greengo.	O-146	1170 ± 100
Manny site, Issaquena County, Miss. Sample of carbonized material, mostly wood from cut Y, at − 40 cm. Sample found within the much-disturbed upper occupation strata. The sherd count indicates Coles Creek phase. Collected 24 February 1955. Submitted by Phillip Phillips and Robert E. Greengo.	O-147	700 ± 100
Mabin site, Yazoo County, Miss. Sample from a deposit of carbonized cane 24 cm in diameter, cut EC, from − 50 to − 56 cm in midden 67 cm deep. The sherds tentatively suggest the Issaquena phase. Collected 20 April 1955. Submitted by Phillip Phillips and Robert E. Greengo.	O-148	1300 ± 100
Manny site, Issaquena County, Miss. Sample from a deposit of carbonized cane and other materials in cut Z, at − 32 cm. Little disturbance indicated. Should date the Coles Creek phase. Collected 23 February 1955. Submitted by Phillip Phillips and Robert E. Greengo.	O-150	800 ± 100
Liberty Bayou site, St. Tammany Parish, La. Slidell quadrangle, SW¼, NE¼, sec. 14, T9S, R13E. *Rangia* shells, (Tchefuncte period) from 24 to 30 in. below the top of the midden. Submitted by W. G. McIntire, Louisiana State University.	O-28	1900 ± 110

Description	Sample No.	Age (yr)
St. Tammany – 1 site, (original Tchefuncte site) St. Tammany Parish, La. Covington quadrangle, lat. 30°19′40″N, long. 90°01′30″W. Deer antlers (Tchefuncte period) from 30 to 60 in. below the surface. Organic and inorganic carbon were submitted separately to radiocarbon assay. The age from organic portion (sample O-30) is considered to be more valid because the inorganic carbonate (sample O-42) apparently contained intrusive material of younger age. Submitted by W. G. McIntire.	O-30 O-42	2200 ± 110 800 ± 100
Bayou Grand Caillou site, Terrebonne Parish, La. Lat. 29°22′38″N, long. 90°43′05″W. *Rangia* shells (Plaquemines period) from 1 ft above sea level. Submitted by W. G. McIntire.	O-39 O-44	200 ± 100 300 ± 100 Average 250 ± 100
Magnolia Mound site, St. Bernard Parish, La. Shell Beach quadrangle, lat. 29°53′18″N, long. 89°32′00″W. *Rangia* shells (Marksville period) from 24 to 36 in. below sea level. Submitted by W. G. McIntire.	O-49	1830 ± 100
River aux Chênes site, Plaquemines Parish, La. Pointe à la Hache quadrangle, lat. 29°37′58″N, long. 89°47′13″W. *Rangia* shells (Troyville period) from 2.5 ft below sea level. Submitted by W. G. McIntire.	O-71	1930 ± 110
St. Tammany – 12 site, St. Tammany Parish, La. Slidell quadrangle, lat. 30°18′40″N, long. 89°51′40″W. *Rangia* shells (Tchefuncte period) from 2 to 3 ft below the surface of midden. Submitted by W. G. McIntire.	O-76	1430 ± 100
River aux Chênes site, Plaquemines Parish, La. Pointe à la Hache quadrangle, lat. 29°37′58″N, long. 89°47′13″W. Bones from the surface of shell midden (Troyville period). Only the organic portion was used in radiocarbon assay. Submitted by W. G. McIntire.	O-77	860 ± 100
Bayou Petre site, St. Bernard Parish, La. Lake Eloi quadrangle, lat. 29°49′48″N, long. 89°25′54″W. Bones from the surface of shell midden (Plaquemines period). Only the organic portion was used in radiocarbon assay. Submitted by W. G. McIntire.	O-78	360 ± 100
Magnolia mound site, St. Bernard Parish, La. Shell Beach quadrangle, lat. 29°53′18″N, long. 89°32′00″W. Bones (Marksville period, but possibly contaminated) from 1 ft below sea level. Only the organic portion was used in radiocarbon assay. Submitted by W. G. McIntire.	O-80	900 ± 100
Metairie Ridge area, Jefferson Parish, La. Spanish Fort quadrangle, lat. 30°01′00″N, long. 90°08′45″W. Charcoal sample (Troyville period) from sea level in shell mound. Submitted by W. G. McIntire.	O-102	1440 ±100
Miller (Belle River) site, St. Mary Parish, La. Pierre Pass area, lat. 29°54′32″N, long. 91°13′00″W. Charcoal sample (Troyville horizon) from 1 ft above sea level. Submitted by W. G. McIntire.	O-104	990 ± 100
Larose area, Lafourche Parish, La. Cut off quadrangle, lat. 29°36′20″N, long. 90°22′25″W. *Rangia* shells (Coles Creek period) from 3 ft above sea level, from earth and shell mound. Submitted by W. G. McIntire.	O-110	1550 ± 100

Description	Sample No.	Age (yr)
Bayou Grand Caillou site, Terrebonne Parish, La. Lat. 29°22′38″N, long. 90°43′05″W. Charcoal sample (Plaquemines period) from 3.5 ft above sea level. Submitted by W. G. McIntire.	O-113	260 ± 100
Magnolia Mound site, St. Bernard Parish, La. Shell Beach quadrangle, lat. 29°53′18″N, long. 89°32′00″W. Bone sample (Marksville period, but possibly contaminated with younger material), from sea level. Only the organic portion was used in radiocarbon assay. Submitted by W. G. McIntire.	O-123	1050 ± 100
Little Chenier site, Cameron Parish, La. Grand Chenier quadrangle, lat. 29°49′30″N, long. 92°54′50″W. Bone sample (Coles Creek period) from 6 ft below the surface of an earthen mound at the contact with chenier matrix. Only the organic portion was used in radiocarbon assay. Tchefuncte period pottery was found in the mound, so that the Coles Creek sample does not date the ridge, but rather the level from which the sample was obtained. Submitted by W. G. McIntire.	O-125	700 ± 100
Blackwater Locality No. 1, Roosevelt County, N.M. Organic portion of charred bones from Sanders gravel pit, Charles Baxter ranch, about 7 mi north of Portales. The stratigraphic position of the sample is post-Pleistocene, and the culture is Archaic. Collected by Oscar R. Shay, Portales, N.M., in August 1954. Submitted by E. H. Sellards, Texas Memorial Museum, Austin.	O-157	4950 ± 130
Blackwater Locality No. 1, Roosevelt County, N.M. Organic portion of uncharred bones from Sanders gravel pit, Charles Baxter ranch, about 7 mi north of Portales. The stratigraphic position of the sample is that of the Portales culture complex. Collected by E. H. Sellards and Oscar R. Shay, November 1955. Submitted by E. H. Sellards .	O-169	6300 ± 150
Blackwater Locality No. 1, Roosevelt County, N.M. Organic portion of charred bones from Sanders gravel pit, Charles Baxter ranch, about 7 mi north of Portales. The stratigraphic position is that of the Portales culture complex, and the sample is identical with sample O-169 except that the bones were charred when found. This sample not only affords a check on the age of the complex, but also permits a comparison of the ages obtained by the use of charred and uncharred bones, respectively. Collected by E. H. Sellards and Oscar R. Shay, November 1955. Submitted by E. H. Sellards.	O-170	6230 ± 150
Plainview Locality, Hale County, Tex. Organic portion of bones from city caliche pit in the southwest part of the city of Plainview. The sample is from the Plainview cultural level. Collected by E. H. Sellards and Otto Schoen, Texas Memorial Museum, Austin, in June 1955. Submitted by E. H. Sellards.	O-171	7100 ± 160
Jaketown Site, Humphreys County, Miss. Shells from Poverty Point horizon, 5.0 to 5.5 ft below surface, near Belzoni. Sample submitted by J. A. Ford, American Museum of Natural History, New York.	O-41	2560 ± 110
Jaketown Site, Humphreys County, Miss. Bone samples from Poverty Point horizon, 10.5 to 12.5 ft below surface, at Jaketown archeological site, near Belzoni. Because of the small size of sample, it was necessary to utilize both the organic and the inorganic constituents of the bones in the radiocarbon assay. Incorporation of the inorganic constituents throws some doubt on the validity of the age. Submitted by J. A. Ford.	O-46	2150 ± 110
Jonesville Site, Catahoula Parish, La. Poorly preserved bones from Jonesville archeological site (formerly termed Troyville Site). Because of the small size of sample, it was necessary to use both organic and inorganic constituents of the bones in the radiocarbon assay. Incorporation of the inorganic constituents throws some doubt on the validity of the age. Submitted by J. A. Ford.	O-48	900 ± 100
Poverty Point Site, West Carroll Parish, La. Plant remains and charcoal sample from basal mound B, Poverty Point archeological site. Sample was extremely poor and consisted primarily of plant remains. Submitted by J. A. Ford.	O-66	3150 ± 120
Lewisville Site, Denton County, Tex. Charcoal sample from an archeological site near Lewisville. The site, discovered and excavated by W. W. Crook, Jr., R. K. Harris, and others of the Dallas Archeological Society, is in an alluvial terrace of the Trinity River (the high, unaltered original Union Terminal-Carrollton Terrace). It was exposed by erosion of the surface of a large borrow pit from which earth was removed several years ago for construction of the Lewisville Dam. Sample from a hearth (hearth No. 1) approximately 8 ft by 10 ft underlain by a heavy red-burned zone approximately 15 in. deep. Stratigraphically, the hearth lies in the basal portion of the locally designated Upper Shuler formation. Prior to excavation of the borrow pit, the hearth lay nearly 20 ft below the terrace surface, this surface in turn being approximately 70 ft above the normal level of the present Trinity River. Associated with the charcoal in this particular hearth were bones of bison, deer, wolf, prairie dog, rabbit, and birds; freshwater clam and snail shells; and charred hackberry seeds. In addition, elsewhere and adjacent in the site, occur bones of elephant, camel, horse, antelope, coyote, glyptodon, and of many small mammals. Also found in the hearth at a location some 20 in. away from the location of the charcoal sample was a Clovis projectile point. The charcoal content of the sample was small, and the charcoal itself was predominately in the form of very small particles. Sample collected in March 1956, by W. W. Crook, Jr., R. K. Harris, and other members of the Dallas Archeological Society. Submitted by W. W. Crook, Jr., Dallas, Tex.	O-235	> 37,000
Lewisville Site, Denton County, Tex. Charcoal from hearth No. 8 (a general description of the site is given in the description of sample O-235). Hearth No. 8 lies approximately 300 ft northeast of hearth No. 1 and on the same stratigraphic level; a continuous area of hearths and faunal remains connect the two.	O-248	> 37,000

Description	Sample No.	Age (yr)
Hearth No. 8 is approximately 30 in. in diameter and 6 in. deep. It contained the charred remains of three small logs from which sample was taken. Associated with charcoal in hearth No. 8 were charred terrapin carapace fragments, small rodent bones, snail shells, and charred hackberry seeds. This sample has been classified by E. S. Barghoorn, curator of paleobotany, Harvard University, as wood charcoal. There was a sufficient number of large fragments to permit hand-picking of the sample for radiocarbon assay. Collected by W. W. Crook, Jr., R. K. Harris, and other members of the Dallas Archeological Society, May 1956. Submitted by W. W. Crook, Jr.		

News of Science

New Type Nuclear Reaction

The observation of a new kind of nuclear reaction that yields energy and is akin to thermonuclear reactions was reported recently to the American Physical Society by scientists in the University of California Radiation Laboratory. The scientists who participated in the research are Luis W. Alvarez, Hugh Bradner, Frank S. Crawford, Jr., John A. Crawford, Paul Falk-Vairant, Myron L. Good, J. Don Gow, Arthur H. Rosenfeld, Frank Solmitz, M. Lynn Stevenson, Harold K. Ticho, and Robert D. Tripp.

The new phenomenon is described as a "catalyzed nuclear reaction." This adds to those reactions already known to science a new and third way of making a nuclear reaction take place. The older ways are either to induce thermonuclear reactions, in which two light nuclei fuse into a heavier one when the temperature is raised to roughly 1 million degrees, or else to bombard nuclei with other nuclear particles from accelerators like cyclotrons or nuclear reactors.

In order to make a nuclear reaction take place, two nuclei must touch. The new discovery is a way of pulling two nuclei together so that a proton and a nucleus of heavy hydrogen (a deuteron) can combine to form helium-3 with the release of 5.4 million volts of energy. This pulling together takes place in a mesic molecule.

In a normal molecule the nuclei of the component atoms are pulled together weakly by electrons. But the electron can be replaced by a much heavier particle, the negative mu meson. Because the mu is 210 times heavier than an electron, it circles the nucleus at only 1/210th the distance of an electron, and thus binds the two nuclei correspondingly closer. The nuclei then have a good chance of touching, and the nuclear reaction can take place.

The reaction is termed a catalyzed reaction because the mu meson is not consumed by the reaction but may be ejected from the molecule by the energy released. The mu is then free to catalyze more reactions, in chain fashion.

The Berkeley group emphasized that at the present time the energy-producing chain of catalyzed reactions cannot continue long enough to generate commercially useful amounts of power, because mu mesons decay into other particles after two-millionths of a second. Unfortunately, from the point of view of thermonuclear power mu mesons can be made only in high-energy nuclear collisions of particles accelerated by cyclotrons and other expensive machines. However, the scientists described as "interesting" the possibilities if a much longer lived particle, with properties similar to that of the mu meson, is ever found. The Russian physicist Alikhanian has reported evidence for such a particle.

The observations were made in studies of photographs taken of tracks in the 10-inch hydrogen bubble chamber which is being used with the Berkeley bevatron, at present the most powerful such machine in the world (a larger one is about to go into operation in the Soviet Union).

The bubble chamber is filled with liquid hydrogen, which boils and forms tiny bubbles along the track of any charged particle that goes through it. Photographs can thus be made of the trail of a particle in much the same way that one can record the passage of an otherwise invisible jet plane by photographing its vapor trail. The bubble chamber was invented at the University of Michigan and has been highly developed at Berkeley. It is tending to replace an older but similar tool, the cloud chamber. This is because a greater number of interesting nuclear collisions and events occur in a given volume of liquid hydrogen than in the more rarified gas of a cloud chamber.

Scientists expected that all mu mesons that came to rest in hydrogen would simply decay. Consequently there was excitement in the Berkeley group when it was noticed that occasionally a particle that looked like a mu came to rest but, instead of decaying, flung out another particle that also looked like a mu, went a short distance, came to rest, and decayed. In some of the photographs there was a gap between the two mu-like tracks. At first there was speculation about a new particle, a "super-mu" which decayed into an ordinary mu.

The pictures are now understood as follows. When the negative mu comes to rest it becomes attached to a proton, forming a mu-mesic atom that is similar to an ordinary electronic atom but scaled down 200-fold in size. In natural hydrogen, one atomic nucleus in 5000 has a neutron stuck to its proton and is called a deuteron. It can be shown that a mu meson prefers to form an atom with a heavy particle at its center; so the mu will form an atom selectively with a deuteron, even though the protons are much more abundant. Any mu-mesic atom will eventually attach itself to another atom to form a molecule.

The gaps are explained as a drift of the tiny neutral mu mesic deutron atom as it dashes away from the proton from which it stole its mu meson. Any complete atom, regardless of its size, is a neutral system, and does not make a track. Being neutral, the mesic atom makes no track.

The result of all these processes is that shortly after a mu comes to rest in hydrogen it finds itself holding a deuteron and proton together in the form of a tiny molecule. The deuteron and the proton are bound so closely that soon