cago. Kilmer's is the only version, however, which has successfully fitted the words to the music.

The key was her observation that some of the musical phrases were repeated. By treating these as though they were simultaneous, she was able to rearrange the sequence of the notation so that the number of syllables in the text matches the number of beats in the tune, even though the tablet gives no indication of tempo or note values.

The result, if Kilmer is correct, is a two-part composition for a singer and a musician, probably a lyre player. It is the existence of this second part which, if valid, has altered the very roots of musical history.

Many musicologists have long felt that early Western music (already shown by the previous tablets to have close ties with the Near Eastern music of Mesopotamia) was strictly monophonic, with only a single line of notes at a time. Kilmer's arrangement suggests that there may have been not only polyphony—more than one voice or sound at a time—but heterophony, in which the notes are different. In other words, harmony, more than a millenium before it was supposed to have developed in even its simplest form.

Until the Ugarit song, the oldest known piece of music was a fragment of a setting for a song in Euripides' play "Orestes," found on a fragment of Greek papyrus dated at about 400 B.C., 1,000 years later. Even the ancient Greeks, however, are believed to have made only the simplest use of polyphony. There was an instrument, for example, called a *magadis*, whose strings were divided by a bridge at two-thirds of their length, creating two notes an octave apart. Singing in octaves was also known, but apparently nothing fancier.

Last week the Ugarit song was performed for the first time, with the exception of a class demonstration a few weeks before, in some 3,400 years. Berkeley musicologist Richard Crocker sang it—in Hurrian—playing the second part on the most appropriate possible instrument, a reproduction of a 4,600-year-old Sumerian lyre, a close relative of the instrument whose tuning texts had made the whole chain of discovery possible.

The lyre was a triumph on its own account. Almost half a century ago, Sir Leonard Woolley discovered the remains of a lyre in a royal tomb of Ur. The wooden frame and presumably gut strings had long since disappeared, but an impression remained in the earth, along with some silver and mother-of-pearl decoration. Though Ur was more than 700 miles from Ugarit, the two cultures were very similar.

Last summer, Kilmer brought specifications and a one-quarter-scale drawing of the instrument back from the British Museum, and during October and November Robert Brown of the University of California's physics department built a life-size version, strung with gut cello strings. For The Song it is tuned to an Ugarit mode equivalent to a Western major scale.

The Song is gentle, not alien sounding at all, with a tune that reminds one of a child's halting experiment on a piano. But what is it about?

"We have such a limited vocabulary in Hurrian," Kilmer says. "There are words in the song about 'beloved of the heart,' 'father,' 'love' and references to gods and goddesses, but that's about all we know so far."

Kilmer is careful to point out that everything—tune, transliteration, the partial translation, even Laroche's hand-copied version of the original cuneiform—is tentative. "The song sounds right to me the way it is now," she says, ". . . but I have to be cautious. We won't really know if these findings are right until another tablet turns up somewhere with another song, and we can confirm them." □

From cosmic rays: A hint of tachyons

Particle physicists must sometimes long for the good old days of physics when falling bodies hit the ground with a reassuring thud or iron bars flew against magnets with a satisfying clang. In particle physics everything is by inference. A flash of light occurs in a scintillator; a short-lived trail of bubbles or sparks appears in a chamber. From such ephemera the experimenter must deduce the nature of the object that has been there. There is no weight to be sensually pondered in the palm of the hand, no force to be struggled against by contracting muscles.

Often, when an experimenter knows in detail the interactions that the particle he is looking for is supposed to have with the material of the scintillator, spark chamber or bubble chamber, he can present a detailed and many-sided argument in favor of its having been there. In cases where theory knows few details about the behavior of the sought particle, all that an experimenter can present is oftentimes only a hint or a whiff that is susceptible to ambiguous argument. Such is the case to which we are coming, which, if the hint be true, presents the spoor of an object that will—it is neither too much nor too trite to say—revolutionize particle physics. The particle in question is the tachyon.

A tachyon is a particle that goes faster than light. For a long time it has been generally believed that nothing can go faster than light. But in the last few years, physicists reexamining the mathematics of the theory with minds sufficiently open to the bizarre, have noted that there are solutions that permit the existence of a class of particles that go faster than light, provided they never go below that speed.

Tachyons are thus objects that are always in flight, never coming to rest. They have their greatest energy near the speed of light, and to increase speed, they must lose energy, contrary to the behavior of ordinary objects, which have to gain energy to gain speed. The rest mass of a tachyon is represented by an imaginary number—this is connected to the principle that it can never be at rest, but the physical significance of the imaginary number is not immediately clear. Some physicists worry that tachyons will violate the principle of causality, that is, they will permit effects to appear before their causes. Others find ways around this dilemma though their opponents accuse them of logic chopping.

A number of experiments to search for tachyons have been set up using various of their odd properties in the hope of identifying them. One that uses their speed is now reported with a positive-seeming result in the March 1 NATURE by Roger W. Clay and Philip C. Crouch of the University of Adelaide in Australia.

When a high-energy cosmic-ray particle strikes the earth's upper atmosphere, it produces a large gang of secondary particles, all of them going at very nearly the speed of light. The gang will reach a detector on the earth's surface at very nearly the same time. Such an event is called an extensive air shower.

If a tachyon should happen to be produced in such a shower, it will reach the ground slightly ahead of the other shower particles. Clay and Crouch set up detectors to monitor the flux of cosmic rays and give them an alert signal whenever an extensive air shower arrived. They could then search the record for about 100 microseconds before the shower to see if there was a nonrandom pattern of arriving particles. Their statistics show such an effect, they say, and they conclude: "Being unable to explain this result in a more conventional manner, we suggest that this is the result of a particle traveling with an apparent velocity greater than that of light."

It will take more than this to make most physicists believe in the existence of tachyons. Yet, if more and more supporting evidence can be adduced, this result may be the very important beginning of a beginning. □