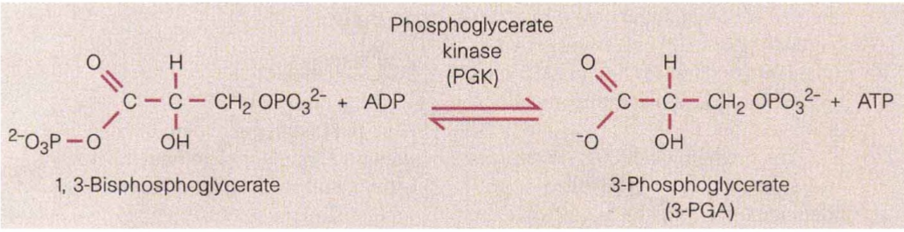

Phosphoglycerate kinase (PGK) catalyses a reversible phosphotransfer reaction that is normally involved in the production of ATP during glycolysis. Bernstein *et al.*[1] have crystallized an active form of PGK, using substrates — ADP and 3-PGA — that cannot be converted to products. They find that when both substrates are bound, the enzyme undergoes a conformational rearrangement that brings the two ligand-binding sites together.

bilized by this mechanism, and allows the formation of a catalytically competent active site.

Hinge-bending requires the presence of both substrates, so the futile hydrolysis of 1,3-bisphosphoglycerate or ATP is prevented. But when both substrates are present, they are brought close enough for a direct phosphotransfer reaction to operate. Bernstein *et al.*[1] have shown that the key factors in the catalytic mechanism include the specific binding of each of the three oxygens of the planar phospho (PO_3) group of the transition state. The transferable phospho group is further stabilized by the helix dipole generated by helix 14.

The conformational change that is shown by this new crystal structure seems to answer the main questions about how PGK brings its two substrates into close proximity in a water-free catalytic site that does not exist in the native enzyme. Although the separate elements in this are not all new — the earlier modelling of the conformational change accurately located the hinge and the magnitude of its rotation[5], and the catalytic mechanism suggested here is similar to that proposed by May *et al.*[6] — these experimental results integrate the subtle molecular changes, and provide the first detailed insight into the way in which PGK is fitted for its precise function in glycolysis.

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Stellar physics

Anaemia reveals star's great age

Mike Bolte

Astronomy is faced with a particularly intriguing dilemma over the age of the Universe. The current best estimate for the expansion time since the Big Bang is less than the measured age of the ancient globular clusters of our Galaxy. Now, for the first time, an independent age has been measured for a single halo star[1,2], and it deepens the difficulties that cosmology faces.

If the Universe is homogeneous and isotropic, its expansion age can be deduced from three observational quantities: the current expansion rate (the Hubble constant), determined by extragalactic distance measurements; the amount of matter in the Universe, which acts to slow down expansion; and the energy density of the vacuum (the cosmological constant), which exerts both accelerative and decelerative forces. Current measurements[3–5] imply expansion ages of between 8.9 and 11.5 Gyr (billion years).

But the globular star clusters that live in the halo of our Galaxy appear to be older than that. Comparing the distribution of luminosity and colour of the individual cluster stars with models of stellar structure and evolution has consistently led to cluster ages between 13 and 18 Gyr. There is little room for adjustment[6–8].

So who has something wrong — the cosmologists, the extragalactic distance-scale army, or the stellar modellers? Because they are in some ways the most complicated, the stellar models come in for most suspicion. Although they pass each observational test so far devised, before we can have full confidence in the age of the Universe as derived from stars, we must develop other techniques for measuring the ages of old stellar systems.

In the 1 May *Astrophysical Journal*, Cowan *et al.*[1] will present a simple, independent estimate of the age of one very old star, CS22892–052, using a particularly clean variation of a method called nucleocosmochronology. Usually in this method, the abundance of a long-lived radioactive element (or the ratio of two elements) is compared with its predicted initial value. That

100 YEARS AGO

The *Monthly Weather Review* (Washington) for September last contains, among various other interesting notes, one upon the first attempt to measure wind force. Prof. Marvin points out that Sir Isaac Newton in his boyhood made a rough determination of the force of a great gale which occurred on September 3, 1658, by jumping first in the direction in which the wind blew, and then in opposition to the wind, and afterwards measuring the length of the leap in both directions. An account of this will be found in Sir David Brewster's "Memoir" of Sir Isaac Newton. The first piece of apparatus applied to the measurement of wind was probably the pendulous plate anemometer introduced by the Royal Society on the recommendation of Sir Christopher Wren and others, about 1665. This instrument gave a measurement of the effect of moving air on a resisting plate. The question of the measurement of the pressure or velocity of the wind by anemometers is still in a condition far from satisfactory, and the recent annual reports of the Meteorological Council show that the subject is still engaging the attention of that body.

From *Nature* 14 January 1897.

50 YEARS AGO

Statistical analyses have been made of the whole intake of the Science Library, London, not merely of three per cent samples. The results are for that reason more reliable, although there is still room for more research, for which financial aid would be desirable... It was established that about 3/4 million useful scientific and technical papers are recorded every year in an aggregate of some 15,000 useful scientific periodicals, while 300 abstracting and indexing periodicals publish also 3/4 million abstracts, or references. But these abstracts, or references, relate to only 1/4 million different papers. So that more than half the useful discoveries and inventions are recorded, only to be buried on the library shelves. This general analysis was confirmed by the examination of the literature of certain subjects. The details of the examination of electrical engineering literature show that only 11,500 different papers on this subject, out of an annual output of 24,000, are covered by a total of 45,000 abstracts, or references.

From *Nature* 18 January 1947.