These lines are consistent with a linear *P-T* transition curve:

$$T\ (°C) = 250(\pm 3) - 15.0(\pm 8)P\ (kbar)$$

A nomogram of unit cell volume versus P and T reveals isochoric lines with positive dP/dT and with sharp breaks in slope at the transition. Positive sloping isochors could be combined with the negative sloping lines of constant γ (Fig. 2) to provide a simple single-crystal internal *P-T* standard for the range of stability of the monoclinic phase.

This study demonstrates the utility of *P-T* crystallography in the determination of phase equilibria. The *P-T* cell is a practical device for x-ray diffraction studies of single crystals to several hundred degrees centigrade and several tens of kilobars. In situ determination of lattice parameters and crystal structures at combined temperature and pressure should be especially valuable in the documentation of nonquenchable, reversible phase transitions, such as that displayed by bismuth vanadate.

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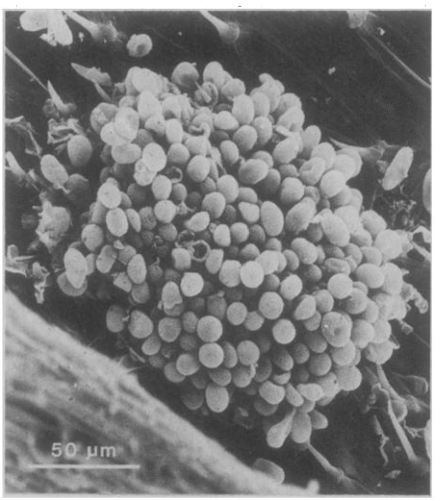
Stem Rust of Wheat 3300 Years Old Found in Israel

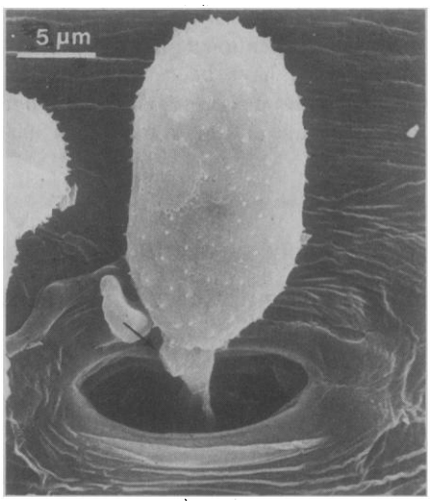
Abstract. *A fungus parasite observed on two ancient lemma fragments of wheat was identified as* Puccinia graminis. *The fragments were found in a storage jar from the Late Bronze Age excavated at Tel Batash, Israel, Uredia, hyphae, and germinating uredospores, though charred, were well preserved.*

Two rust-infected wheat lemma fragments from the Late Bronze Age II (1400 to 1200 B.C.) were found at Tel Batash on the piedmont of the Judean Mountains, Israel. The fragments were in a nearly intact storage jar that was full of wheat grains and also contained some unthreshed spikelets. The jar was excavated from a storage space located beneath wooden steps leading to the second story of a public building. It was sealed under a thick layer of charred wood and fallen bricks (*1*). Although charred, the wheat grains, as well as some ear parts, were well preserved; there was almost no damage even to the vulnerable epidermis and its hairs. The wheat belongs to the archeobotanical naked tetraploid species *Triticum parvicoccum* (*2*). Some investigators include this species in *T. turgidum* (*2*, *3*).

One large longitudinal and two smaller round uredia were observed on the larger lemma fragment (Fig. 1). A large longitudinal uredium was also seen on the smaller fragment. All infestations were located on the inner concave face of the lemma. In the scanning electron microscope, various stages of spore germination, including penetration into the lemma, could be observed (Fig. 2). The characteristic ruptured epidermis of the host along with the oval echinulate uredospores (17 by 11 μm) with four equatorial germ pores (Fig. 3) enabled identification of the fungus as *Puccinia graminis* f. sp. *tritici*, the cause of stem rust of wheat (*4*). The charred uredospores are smaller and rounder than uncharred *P. graminis* f. sp. *tritici*, as is common for other archeobotanical specimens (*5*).

The delicate structures of the pustules, the hyphae, and the germinating uredospores were well protected during the





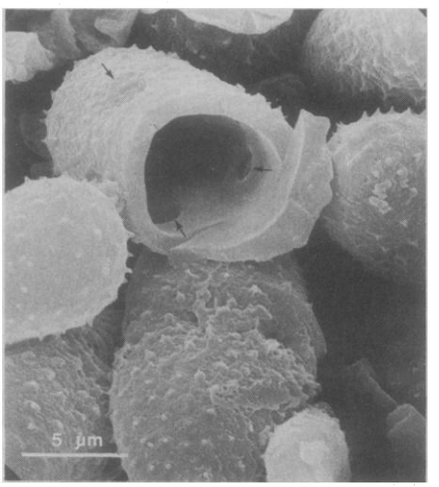


Fig. 1 (left). Pustule of *Puccinia graminis* on the inner surface of a lemma of *Triticum parvicoccum*. Fig. 2 (top right). Penetration of germinating tube into host stoma. Only remnants of the vesicle-like appressorium (arrow) are present. Fig. 3 (bottom right). Four equatorial germ pores (arrows) characteristic of *Puccinia graminis* are visible on the broken uredospore.

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millennia by their location in a well-sealed environment and by concealment between the glumes of a whole spikelet. As a result of the transfer of the fragile material from the excavated site and handling in the laboratory, several specimens disintegrated, exposing the fungi and leading to more detailed examination.

According to some commentators (*6*), rust is mentioned in the Hebrew Bible (*7*) as a crop-damaging disease called *yeraqon*. This Hebrew word, referring to some phenomenon characterized by the color green or orange, also appears in the Mishnah to describe a kind of spreading plague of wheat (*8*). From the Biblical and the Mishnaic contexts, it is reasonable to suggest that *yeraqon* was the ancient term for infestations of *Puccinia graminis* f. sp. *tritici*, for when this rust strikes in a given year, its effects may be devastating and widespread. The Greeks also knew it in classical times (*9*). Other wheat diseases, although more common, are usually less destructive to the annual crop.

Archeological fungal remnants are found only rarely. These include sclerotia of species such as *Claviceps purpurea* or *Cenococcum geophilum*, or the hard fruiting bodies of *Polyporus* (*10*). In addition, some exceptional findings of microscopic fungi have been reported: *Mycosphaerella*-infested *Lolium perenne* grass from ancient Egypt more than 3000 years old (*11*); the hyphae of a fungus that attacked darnel grains in Egypt about 2000 B.C. (*12*); wine and beer yeast cells from the 11th Egyptian dynasty (*13*); and spores of several species of *Ustilago*-attacking barley found in the stomach of Grauballe man from the first centuries A.D. in Denmark (*14*).

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H-2 Histocompatibility Region: Influence on the Murine Glucocorticoid Receptor and Its Response

Abstract. *The influence of the* H-2 *histocompatibility complex on glucocorticoid receptor levels, and the biochemical response of glucocorticoid action measured as the degree of inhibition of prostaglandin production, has been studied in the mouse thymus and lung. The B10A* (H-2^a) *strain of mice has significantly higher glucocorticoid receptor levels and a significantly greater biochemical response to glucocorticoid than the B10* (H-2^b) *strain, which differs from B10A within the* H-2 *complex only. Thus, the anti-inflammatory hormone response of glucocorticoids is correlated to hormone receptor level, both of which are influenced by the* H-2 *locus.*

Susceptibility to cortisone-induced cleft palate in the mouse is regulated in part by two genes acting by complementation within the *H-2* histocompatibility complex on chromosome 17 (*1–6*). The same genetic region also appears to influence the level of glucocorticoid receptors in mouse embryonic palatal cells (*7, 8*). *H-2*–linked genes cannot be demonstrated to regulate receptor levels in the liver (*8–10*); this is in agreement with observations of tissue-specific variation in cortisol receptors in rats (*11*). Recently, it has been reported that *H-2* regulates the degree of glucocorticoid thymolytic responses in the mouse (*12, 13*). Thus, it is possible that *H-2* regulates glucocorticoid receptor levels in the thymus. Since both the hormonal action (*14, 15*) and teratogenic action (*16, 17*) of glucocorticoids involve inhibition of arachidonic acid release and of subsequent prostaglandin and thromboxane production, we have sought to examine whether glucocorticoid receptor levels and the degree of inhibition of prostaglandin production may be influenced by *H-2* in thymocytes of the B10A and B10 mouse strains. The B10 and B10A strains are genetically similar, except for the *H-2* complex and closely linked genes on chromosome 17, where B10A is *H-2*^{a} and B10 is *H-2*^{b}. We now report that *H-2*–linked genes influence glucocorticoid receptor levels in the thymus as well as in the lung. We also demonstrate that, in thymocytes, glucocorticoid receptor levels correspond to the amount of inhibition of prostaglandin and thromboxane production by glucocorticoids.

Dexamethasone was used for most of the experiments, since dexamethasone is tightly bound to the receptor and does not bind to transcortin or ligandin (*18, 19*). Moreover, dexamethasone has a very high potency as a glucocorticoid (*20*). We used the method of Katsumata *et al.* (*8*) to look for a glucocorticoid-binding receptor protein in thymocytes and lung cytosol. The receptor level and degree of inhibition of prostaglandin production by glucocorticoid were studied in the B10A congenic strain and its inbred partner B10, and inhibition of prostaglandin synthesis was studied by use of a radioimmunoassay procedure.

We found that the [^{3}H]dexamethasone binding sites in thymocytes (Fig. 1) and lung (Fig. 2) are saturable. A Scatchard analysis of the binding activity indicated a single class of binding molecules in both lung and thymus. The dissociation constant, K_d, of the glucocorticoid receptor protein in thymocytes is significantly higher in the B10A than in the B10 receptor protein ($K_d = 6.3 \times 10^{-8} \pm 2.6 \times 10^{-8} M$ in B10A, and $3.4 \times 10^{-8} \pm 0.9 \times 10^{-8} M$ in B10), but no significant difference in the K_d value was noticed in the lung cytosol of the two strains (Table 1).

The receptor content in the lungs and in the thymocytes was significantly higher in the B10A strain than in the B10 strain (Table 1), and this was true for both males and females. Although there was no difference in the receptor content of male and female thymuses, we found a significantly higher receptor content in lung cytosols from females than from males in both strains.

We also determined the receptor level in the thymocyte nuclear fraction in order to examine whether the strain difference in receptor content could be observed in the receptors that translocated to the nucleus. The results showed that the nuclei of the B10A mice had a significantly higher receptor content than did those of the B10 mice (Table 1).

In the second series of experiments, we investigated glucocorticoid-induced suppression of prostaglandin production (Table 2). Dexamethasone (5 to 100 μM)

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