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**PYRAMID OF THE MAGICIAN
UXMAL, YUCATAN, MEXICO**

The Pyramid of the Magician at Uxmal, Yucatan, Mexico is this issue's limited edition signed print by Ladd P. Ehlinger. The name of this building is a very poor translation from the Spanish name: *Pirámide del Adivino*. Adivino literally means fortuneteller or guesser, a kind of seer. This is a more appropriate name for a structure where divination was practiced on it and within it as a major activity. The Maya were avid astronomers and astrologers, and this was the structure from which they stargazed in Uxmal. It functioned as an observatory and place of predictions derived from those observations.

The view in the sketch is of the east stair, which is actually facing slightly south of east. The sunshine angle is in the late afternoon, from the northwest.

This pyramid was constructed over a period of about three centuries, ca. 600 to 900 AD. The construction was not to a single fully executed plan that was known from the beginning, however. The first temple built here was superimposed by a later temple, and this one likewise. There were actually five superimposition temples built here.

In the reconstruction, excavations exposed the earlier temples. The first temple, Temple I, can be seen beneath the great west staircase. Temple II is below the east staircase, from which an opening was recently cut to provide access. Temple III was originally reached

from an east side staircase that was also later buried by a subsequent staircase. Temple IV is in front of Temple III, acting as a narthex (sort of a foyer) to it. Temple V is the one visible on the top. It raised the elevation of the pyramid considerably, as its floor completely covers the roof comb (a sort of screen decoration that was tall and thin to increase the apparent height and thus importance) of Temple II which is thus buried whole. Temple IV is in the Chenes style (an adjoining region), its facade representing the god Chac, whose jaws serve as the doorway.

There is a very peculiar aspect of the succeeding superimpositions of the Pyramid of the Magician: the succeeding Temples changed their compass orientation from the preceding Temples that they superimposed or covered over. No one seems to know why, although speculation abounds that alterations in the religious role were expressed by these changes.

The exterior steps on this pyramid are extremely steep, more so than at any other Middle American pyramid site. To descend safely, the writer had to use a chain that functions as a handrail. This chain is draped over the treads and securely anchored periodically to the stone. This chain was provided by the restorers of the structure, it did not exist in Mayan times. At other Mayan sites, chains have also been provided, but one can descend safely at these sites also by walking a diagonal zigzag pattern.

There has been a lot of conjecture about how the Mayans ascended and descended these types of stairs safely without chains and why they were built so steeply. Most archaeologists agree that the steepness was intended to intimidate the faithful and to discourage casual access to the temples on top, by making traversing these stairs an arduous and dangerous experience, but no one is really sure.

CFC's, the OZONE HOLE, and YOUR FUTURE COMFORT

What do CFC's and the ozone hole have to do with your future comfort? Plenty! Because if what is scheduled to take place, along with what knowledgeable people think will also happen, your comfort will be considerably reduced, especially in the deep south, in air conditioned buildings and vehicles.

CFC is an anagram for ChloroFluoroCarbon, the chemical that has been used in the recent past as the most prevalent refrigerant in air conditioners, refrigerators and freezers. CFC's are additionally used as aerosol propellants, and as the bubble maker for foams used in insulation and cushions. CFC's have also been identified as the cause of the thinning and depletion of the ozone layer of the atmosphere, particularly over the poles.

An ozone hole (a complete depletion of the atmospheric ozone in a relatively small area) was first observed and recorded by scientists over Antarctica in the winter months over several seasons recently. Subsequently, an ozone hole has been recorded over the Arctic as well. Scientists have concluded that a general thinning of the ozone layer has occurred around the earth also. This conclusion was reached by analysis of the gas content of prehistoric ice in glaciers around the world. In eons past, the ozone content was much higher than now, and there was but a minute fraction of chlorine in the atmosphere then compared to recent times.

Scientists have equated rising rates of skin cancer in humans and depletion of amphibian populations (frogs) to the increase in the amount of the ultraviolet radiation component of sunlight that penetrates the atmosphere to the surface without the filtering effect of the ozone.

The chlorine atoms in the CFC's interact in the atmosphere to deplete the

ozone in a complex chemical reaction. There are many types of CFC's in basic chemical composition, but all are composed of only three types of atoms: chlorine, fluorine, and carbon. There are differing proportions of the constituent atoms in each type of CFC. The different types of CFC's are designated by numbers, e.g., CFC-11, CFC-12. Freon is a brand name of a Dupont manufactured CFC.

In any event, when these chemicals were discovered about 50 years ago, they were hailed for being relatively non-toxic, non-flammable, inexpensive and very efficient as a heat transfer medium. They are also very stable chemically, which gives them time to move into the upper atmosphere and react with the ozone.

Once CFC's were identified as the culprit in the ozone depletion problem, governments around the world moved to agree to ban their use by treaty and thus triggered a search for alternative chemicals, particularly for use as refrigerants. North America, South America, Europe, the former U.S.S.R., India, China, Australia and the Far East are all large producers and consumers of CFC's. The nations in these regions, but in particular the United States and those of Western Europe, have pushed hard for alternative refrigerants.

Hydrochlorofluorocarbons (HCFC's) and Hydrofluorocarbons (HFC's) are two compounds related to CFC's that are being developed as alternative refrigerants. HCFC's contain one or more atoms of hydrogen which usually is a replacement for one or more of the chlorine atoms in a CFC. Adding hydrogen does not alter most of the properties except that of stability, so HCFC's are not as damaging to the atmosphere. Because the HCFC's still contain chlorine, they will also eventually be phased out of production and use. HFC's contain no chlorine and are thus not considered harmful to the atmosphere.

The CFC's that have been in common usage as refrigerants have been R-11 (CFC-11), R-12 (CFC-12). R-11 is a low pressure application and R-12 is a high pressure application.

The HCFC that has been in common usage is R-22. It has been manufactured and in common usage almost as long as R-11 and R-12, and has been promoted as a substitute for R-12. This will work for a while, but there are problems with it and all the substitute refrigerants.

The substitute refrigerants frequently will cause a loss of .5 to 20 percent of cooling capacity depending upon the refrigerant. To make up for these losses, sometimes a change in impellers, gearing and/or motors is required, if the original capacity has to be maintained. This is the single largest factor of the refrigerant change-out that will affect your comfort for the worse.

Some substitute refrigerants will attack the lubricating oils and rubber or plastic seals of the equipment, forcing a retrofit of the equipment equaling in some cases a total overhaul. Any substitute refrigerant has to be similar to that replaced in critical and boiling temperature, condenser pressure and temperature, specific heat, specific volume, toxicity, efficiency, explosiveness, dielectric strength, viscosity, thermal conductivity and cost. To maintain your comfort in the future, you will probably have to increase capacity of the cooling equipment and spend more money for maintenance.

R-123 (HCFC-123) has been decided as being the refrigerant for low pressure applications, R-134a (HFC-134a) for high pressure applications, and R-22 (HCFC-22) for high pressure applications in light commercial and residential applications. R-123 is used in centrifugal chillers. The refrigerant it replaces, R-11, is less toxic, but both are anesthetics and thus require positive and secure ventilation in the

spaces containing equipment charged with these refrigerants.

R-134a will ultimately replace all high pressure refrigerants for food service, commercial and institutional equipment, such as reciprocating, scroll and screw equipment. R-134a replaces R-12 refrigerants and unlike R-123 is not nearly as toxic. The cost is about 50% more, however. Also, R-134a attacks most lubricants and seals that were used with R-12. To effect a changeover, these components have to be changed to compatible types.

Some automobile air conditioners are being manufactured and supplied with R-134a refrigerants right now. The backyard mechanic cannot add to or change the refrigerant as he could before with the R-12 variety because the containers for the refrigerant require special tools to manipulate them. The cost of servicing will thus go up.

R-22 is the refrigerant that has been used for quite some time in light commercial and residential air conditioning equipment. It is considered to be "tried and true". R-22 can be used also in high pressure screw, scroll, reciprocating, and even centrifugal chillers. It is currently being promoted as the best alternative for food service refrigeration.

R-22 under the current law is plentifully available, and will be phased out starting in 2015 or later. Production is allowed until 2020 under the Clean Air Act. Because R-22 is an HCFC and is injurious to the ozone layer also (in lesser amounts than CFC's), the Germans are talking of banning R-22 in the year 2000. The remainder of Europe may well go along, which will put great pressure on the U. S to follow suit. The big problem with this scenario, if it happens, is that no alternatives for R-22 have been hypothesized and tested. Imagine sleeping in your bedroom in the deep south with no air conditioning in August 2001!