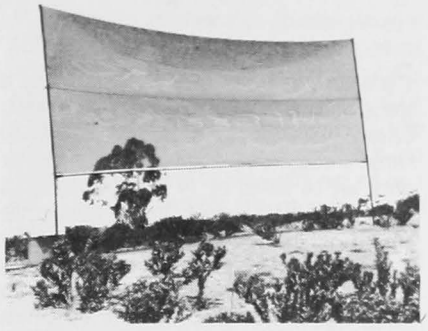
AES Scientist Draws Drinking Water from Fog in the Andes

We believe that AES research scientist Bob Schemenauer's expedition to northern Chile to conduct experiments in extracting drinking water from high altitude fog to be a unique project in a water-short world. Until now Dr. Schemenauer has received very little publicity for his work and it may interest readers to know that his work site is only about 100km away from the work-place of another key Canadian scientist, Ian Shelton discoverer of the first supernova in 383 years. Making the discovery from a small observatory at Las Campanas, Shelton took advantage of the same clear, dry atmosphere that Schemenauer used for his drinking water experiments.

Bob Schemenauer



This 40 m² nylon mesh fog water collector is installed on a ridge in northern Chile.

On October 25, Dr. Robert S. Schemenauer, a physicist in the Cloud Physics Research Division (ARPP) flew down to Chile to conduct a project that wrings drinking water from fog.

In a world increasingly threatened with water shortages, Bob's project is aimed directly at an economic target — to produce water from fog in sufficient quantities to promote habitation and cultivation in arid locations. Northern Chile is very arid — at Arica, in Chile's farthest north, annual rainfall is 0.7mm, one of the most arid spots on the face of the earth. But northern Chile has lots of fog, and the concept of extracting water from this fog has been around for many years.

The high elevation fogs of northern Chile are called camanchacas. They are created by northern Chile's prevailing weather. Bob explains — "In the northern third of Chile and Peru, the weather is dominated by the Pacific anticyclone throughout the year. This produces a light southerly or southwesterly flow in the lower kilometre of the atmosphere and results in a stratus or stratocumulus cloud that extends a few hundred kilometres out over the ocean." The clouds form and drift in from over the ocean and envelope the coastal mountains. These camanchacas are a potentially rich source of water.

The site selected for Camanchaca Project is an old abandoned iron mine called El Tofo beside a little village 60 km north of the city of La Serena (population 90,000). The El Tofo area is "arid and rocky with a sparse coverage of cacti and shrubs". Rainfall is less than 100 mm a year and so the village must truck its water in. El Tofo is 5 km from the coast and 780 m above sea-level. Experiments have shown that 600-800 m is the best height at which to intercept the camanchaca.

El Tofo is therefore an ideal location to test the economic targets of the Camanchaca Project. It has plenty of fog more or less year round and this fog has the essential quality of being pollution-free. Bob's background in cloud physics, cloud chemistry and in operating the chemistry of High Elevation Fog (CHEF) project in Quebec make him ideally suited to play a major role in this project.

Can the project provide El Tofo's neighbouring village with water from fog more cheaply than it can be trucked in? Can it provide water in an abundance sufficient to irrigate the surrounding terrain and promote the growth of Chile's rural areas? The villagers, for economic reasons, truck in just enough water to meet their minimum daily requirements.

Bob mentions that on the small summit above El Tofo "is an anomalous grouping of eucalyptus trees" planted by the iron miners to provide shade many years ago. The miners kept the trees watered until they were 2 m tall, at which point the trees were able to extract their own water from the surrounding fog. The trees are now 10 m tall — and demonstrate what can be done for the entire terrain if adequately supplied with water.

The technique for collecting water from fog is simple and effective. It consists of nothing more than a broad rectangle of cheap, locally available nylon mesh stretched out between two wooden poles stuck in the ground. A flow of air has a tendency to evade and flow around solid objects. This is why the nylon cloth is a mesh. The interstices in the mesh allow the air to pass through. It leaves the strands of the mesh beaded with tiny drops of water. These merge into each other and form drops heavy enough to trickle down the strands of the mesh into the trough that forms the bottom boundary of the mesh. In a very dense fog, this mesh will drip water at the rate of 10 litres of water per square metre per day.

The Camanchaca Project will set up about 60 of these nylon meshes, each one containing 40 square metres of material. Most will be set up on a small summit between two major peaks.

The water-from-fog concept in Chile has been under study for some time. Dr. Schemenauer's colleagues are Humberto Fuenzalida, University of Chile, and Pilar Cereceda, Pontificia Universidad Catolica de Chile. In their joint paper "A Neglected Water Resource: The Camanchaca of South America", they cite references dating back to 1966. A lot of meteorology, climatology, physics and other sciences have provided the practical pre-conditions for the Camanchaca Project.

It is not simply a case of going to El Tofo and setting up those meshes. Relevant meteorology must be studied concurrently. The annual harvest of water must be accurately computed. The engineering of the pipes and reservoirs for the water must be completed — and the costs of all this must be itemized to deliver a substantial estimation of the viability of the scheme. "A Neglected Water Resource" deals in detail with all aspects of the scheme.

The crew at the El Tofo site will include about 15 people — some of them Chilean university students. Present also will be two AES technicians from ARPP — Mohammed Wasey and Richard Poersch. They have packed up and shipped down some of AES's most advanced cloud physics and atmospheric sounding instruments and will be responsible for much of the on-site instrument operation.

Bob was also centrally involved in arranging the funding of the Camanchaca Project with the International Development Research Centre (IDRC) and acts as a liaison between the Chilean groups and IDRC in Ottawa.

Once the engineering aspects of the Camanchaca Project have been completed, the equipment can be operated and maintained by the villagers themselves.

Optimistically, if the project is a practical success, it will be the paradigm for similar projects world-wide, wherever there is a combination of aridity, mountains and clean fog.

November 15, 1983: A week of heavy rain in SW coastal British Columbia, resulted in Vancouver's water supply turning murky, the scenic highway to Squamish closing due to mud slides and several bridges washing away.

November 17, 1985: Heavy snow fell for most of the week across Labrador. By the 17th, 100 cm of snow had fallen. In a 2-day period Goose Bay exceeded its normal monthly total of 57 cm. Strong winds above 100 km/h disrupted the P.E.I. ferry service.

November 19, 1985: A blizzard swept across southern Manitoba, dumping 20 cm of snow. Winds of 60 km/h piled snow into deep drifts. In many rural areas school buses did not run because of whiteouts. Clean-up costs in Winnipeg alone exceeded $1.5 M.