the author as

$$\frac{1}{\Gamma\left(\frac{\nu-p-q+1}{2}\right)\Gamma\left(\frac{\nu-p+1}{2}\right)} e^{-\frac{1}{2}\delta^2} U^{\frac{q-2}{2}} (1+U)^{\frac{\nu-p+1}{2}}$$

$$\times \sum_{m=0}^{\infty}\sum_{l=0}^{\infty}\left[\frac{\Gamma\left(\frac{\nu-p+1}{2}+m\right)\Gamma\left(\frac{\nu+1}{2}+l\right)}{\Gamma\left(\frac{q}{2}+m\right)\Gamma\left(\frac{p}{2}+l\right)\Gamma(m+1)\Gamma(l+1)} (\tfrac{1}{2})^{m+l} (\delta^2)^l (\Delta^2-\delta^2)^m \left(\frac{U}{1+U}\right)^m\right] dU$$

$$\times I\left\{\frac{\Delta^2-\delta^2}{2}, \frac{\nu-p-1+2m}{2}, \frac{p-2+2l}{2}\right\}$$

where $I(k, a, b) \equiv \int_0^1 e^{-kx} x^a (1-x)^b \, dx$

In the above distribution δ^2 and Δ^2 are population parameters, the hypothesis under test being $\delta^2-\Delta^2=0$, and ν is the digress of freedom of the sample estimates of the population dispersion matrix.

Details are being published in the *Journal of the Ind. Soc. of Agr. Stat.*

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New Delhi,
March 15, 1949.

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NATURAL GAS AT JAWALAMUKHI MANDIR

THE history of the Baku oil-fields[1] in the Caucasus mountains is associated with the fire worshippers, who went there to visit the petroleum flames burning natural gas emitted from the earth. To them it must have appeared a very wonderful and awe-inspiring sight to see a fire fed with invisible fuel and burning from time immemorial.

Inside the famous temple, *Jawalamukhi Mandir*, in *Kangra District*, East Punjab, India, gas is constantly coming out of the soil and is being burnt. Through the year round people from distant places flock to this temple as a place of worship. As the gas does not appear to have been analysed so far, we considered an analysis desirable. Though the gas from inside the temple could not be collected, yet a sample of this gas was procured from *Tibi Gorakhnath*, distant a few feet from the temple. Gas was collected in an air-tight glass aspirator over gas-saturated ditch water. It was analysed in these laboratories using a modified Orsat's gas analysis apparatus. Its flame is very poor in luminosity. It showed practically no absorption over fuming sulphuric acid, bromine water and ammoniacal cuprous chloride solutions. The olefines, acetylenes and carbon monoxide, if present in the gas, may be present only in very small quantities. On exploding the residual gas with oxygen, the results of four different experiments showed it to contain a large amount of aliphatic hydrocarbons estimated as methane and a small portion of hydrogen. The composition of the gas corresponds almost to the natural gas coming out of the oil wells.

It is now well known that the Attock Oil Company[2] has been producing crude oil by drilling at Khaur, 45 miles south-west of Rawalpindi since 1914. Unsuccessful test-wells have been drilled in the Marwat Range, Trans-Indus, on the Sukkur dome, south of Rohri, in Sind and on the Mekran coast near Chandragup. It is most probable that oil occurs in the vicinity of Jawalamukhi Mandir either as a separate oil-field extending from Jammu to the Simla Hills or as an extension of the Indus oil belt.

India is very poor in her internal sources of petrol. Before the partition of the country, crude oil obtained from the oil-fields in Assam and the Punjab was utilized for the production of petrol. With the partition of the country by the creation of Pakistan, the Punjab oil-fields have passed on to the sister dominion and the Indian

ıion is left only with the solitary source Assam, which can meet nearly 10 per nt. of the country's petrol demand. For e rest of her consumption, India to-day s to import the supplies mainly from the ighbouring countries, namely Burma, an, Iraq, Bahrein Islands, etc. Recently e Government of India has invited reign oil experts for consultations to set oil refineries along the Indian coast and manufacture synthetic petrol from the isting grades of Indian coals by the well-ıown Fischer-Tropsch method. It is, there-re, all the more necessary that large-ale oil prospecting in Kangra Valley ed to be carried out by the Government India and a number of oil wells be illed after successful oil prospecting has een completed by the oil experts.

The authors take this opportunity of anking Principal Narinjan Singh, Head the Department of Chemistry, East unjab University, for procuring us a mple of gas from the temple for analysis.

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EMISSION SPECTRA OF THE MANGANESE HALIDES

N a previous paper,[1] the author reported system of bands of MnCl in emission in he region λ 3900-λ 3500. On the analogy f the interpretation of the MnF bands by Rochester and Olsson,[2] the above system vas considered as due to a $^1\pi—^1\Sigma$ transition. But on account of the complex structure and ıbnormal intensity distribution among the ıeads, a transition $^7\pi—^7\Sigma$ (rather than $\pi—^7\pi$ as considered by Muller[3]) involv-ng high multiplicity terms was suggested ıs perhaps more probable. While the ınalysis on this basis was in progress, Bacher[4] published a paper on the structure of the Mn halide bands, attributing them to the transition $^7\pi—^7\Sigma$. In MnCl, Bacher's analysis could be complete only for the $\Delta v=0$ sequence; the bands are obtained in absorption. The author has since confirmed the scheme and extended it to the remaining sequences $\Delta v=\pm1, \pm2, \pm3$, which he could obtain with a fairly good intensity in emission. A similar analysis of the MnBr bands corresponding to the higher sequence $\Delta v=+1$ is also obtained.

Details of the work have been communicated recently for publication in the *Indian Journal of Physics*.

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Waltair,
April 5, 1949.

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THE BAND SPECTRUM OF TiCl

IN the course of extensive investigations in our laboratory on the complex band spectra of diatomic molecules notably the halides of the transition group of elements, the band spectrum of TiCl is investigated. A characteristic spectrum is obtained by running a transformer discharge through TiCl vapour. Two systems are photographed in the regions—λ4209-3702, comprising in all of five groups. The first system was partially analysed by More and Parker. The two systems have a common ground state. The transitions may be $^4\pi—^4\Sigma$ and $^4\Sigma—^4\Sigma$ for the less and more refrangible systems respectively. The following are the approximate vibrational constants:

	ω_e'	$x_e'\omega_e'$	ω_e''	$x_e''\omega_e''$
System I	534	1·5	455	3·8
System II	474	4·4	455	3·8

Details of the analysis will be published shortly elsewhere.

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A STUDY OF THE SCATTERING OF LIGHT IN NORMAL URINES

IN a note[1] in the *Indian Journal of Physics*, S. Ranganathan reported results of depolarisation measurements of light scattered transversely in samples of normal