world tensor with components $\chi^{\mu\nu}$ ($\mu, \nu = 1, 2, 3, 4$) these equations can be written

$$(1) \quad \begin{cases} \sum_{\nu=1}^{4} \frac{\partial \chi^{\mu\nu}}{\partial x^{\nu}} + \varkappa^2 U^{\mu} = 0 \quad (\mu = 1, 2, 3, 4) \\ \chi^{\mu\nu} = \frac{\partial U^{\nu}}{\partial x_{\mu}} - \frac{\partial U_{\mu}}{\partial x_{\nu}} \end{cases}$$

where $(x^{\mu}) = (x, y, z, ct)$ are the space-time co-ordinates and $\varkappa$ is the universal constant determining the range of the forces. Similar equations hold for the conjugate complex quantities $\widetilde{U}^{\mu}$ and $\widetilde{\chi}^{\mu\nu}$.

The charge and current densities connected with the new particles are given by the components of the four vector

$$(2) \quad S^{\mu} = e.i \sum_{\nu=1}^{4} (\widetilde{\chi}^{\mu\nu} U_{\nu} - \widetilde{U}_{\nu} \chi^{\mu\nu}) \quad (\mu = 1, 2, 3, 4),$$

which vanish only if the real and imaginary part of the field quantities have a constant ratio and in general represent particles of either positive or negative charge.

It has already been pointed out by several authors[3] that it might be necessary to introduce neutral particles also to account for the big forces between two neutrons and between two protons, and the question has been discussed what kind of field equations are suited for the representation of such particles. The only simple equations, however, which have the right spin properties and always give positive values for the energy are those of Proca, and it may therefore be of interest to remark that the solutions of (1) where the real and imaginary parts are not independent of each other and which accordingly give no contribution to the charge and current densities in (2) will just seem to be suited to represent such fields.

In that case it is, of course, only necessary to consider *real* field quantities U^{μ} and $\gamma^{\mu\nu}$ and the representation of the nuclear fields shows, therefore, a striking resemblance to the ordinary electromagnetic theory from which the equations (1) only differ by the terms containing the universal constant $\varkappa$. Accordingly, the quantization of these equations can be performed exactly as in quantum electrodynamics, that is, the radiation field can be treated as an infinite number of harmonic oscillators or as an assembly of quanta. As regards energy and momentum these quanta will behave like material particles with rest-mass $m = \frac{\hbar \varkappa}{c}$, but, as in the case of photons, it is impossible to define a density in ordinary space of the heavy quanta, the particle properties of which result only from the quantization.

From this point of view the field theory based on the equations (1) offer possibilities of accounting for forces between like and unlike nuclear particles of a more general character than hitherto recognized. These consequences will be discussed in detail in collaboration with L. Rosenfeld in a forthcoming paper to be published in the *Proceedings of the Copenhagen Academy*.

Institute for Theoretical Physics, Copenhagen. July 9. C. MØLLER.

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Spectrum of Rubidium Hydride, RbH

A BAND spectrum of the many-line type has been obtained from a discharge through a mixture of rubidium vapour and hydrogen. The discharge tube with a constriction in the positive column which was originally designed for the production of the manganese hydride spectrum[1] was found to be an intense and economical source; the spectrum has been photographed on a 20-ft. concave grating spectrograph with exposures ranging from 10 to 40 minutes.

The spectrum, which extends from 4800 A. to 6500 A., is very similar to the already known spectra of the diatomic hydrides of the alkali metals, the bands being due to a $^1\Sigma \rightarrow {}^1\Sigma$ transition and being strongly degraded to the red, so that the heads are poorly developed and have only been observed for some of the strongest bands. So far, nineteen bands have been classified, and a preliminary analysis leads to the following approximate values of the molecular constants:

$\nu_e = 18912$ cm.$^{-1}$	$\nu_0 = 18573$ cm.$^{-1}$
$\omega_e' = 248$	$\omega_e'' = 934$

The large difference between ω_e'' and ω_e' produces some uncertainty in the assignment of the values of v', and the values given below may have to be raised by one or possibly two units. The vibrational energy terms of the upper electronic state, like those for the hydrides of the other alkali metals, are anomalous in having a negative value of $\omega_e' x_e'$.

The following are the approximate positions of the heads of the strongest bands,

λ	v', v''	λ	v', v''
6277	0,3	5345	4,1
6178	1,3	5267	5,1
5871	1,2	5027	5,0
5782	2,2	4958	6,0
5694	3,2	4891	7,0
5422	3,1	4826	8,0

The investigations are being continued, and a rotational analysis is in progress.

A. G. GAYDON.
R. W. B. PEARSE.

Imperial College of Science,
South Kensington, S.W.7.

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Surface Films of Gliadin

MITCHELL[1] has reported that under suitable conditions proteins can be spread from a solution to give films the force-area curves of which show a sharp transition point in the region of 1–2 dynes/cm., the extrapolated areas of the two distinct portions of the curve being approximately 0·3 and 0·7 $\times$ 10^{-7} gm./sq. cm. respectively. The requirements for such a curve seem to be (1) a dilute spreading solution, and (2) a time interval of 1–15 hours between spreading and measurement. Since this is the first case in which a definite transition point has been observed with proteins, we have repeated the measurements using, so far as could be ascertained, the same conditions as Mitchell. Dilute solutions of gliadin in 70 per cent aqueous alcohol were used for spreading on $N/100$ sulphuric acid or hydrochloric acid substrates, and the time interval ranged from 3 to 1,065 minutes.

There was no evidence at all of a transition point in any of the curves, and the time interval required for the film to reach equilibrium was only 5 minutes. If the interval was very large (greater than 1–2