remarked that if, in chemistry, it be true that *Corpora non agunt nisi liquida,* then, in chemiotherapy, it is no less true that *Corpora non agunt nisi fixata.* Whatever precisely may be involved in the important principle of "fixation" as applied to drug actions, it remains, I think, true that the older adage applies to the dynamic *reactions* which occur in the living cell. But there are doubtless dynamic phenomena in which the cell complexes play a prominent part. The whole of our doctrine concerning the reaction of the body to the toxins of disease is based upon the fact that when the cell is invaded by complexes other than those normal to it, its own complexes become involved. I must not attempt to deal with these phenomena, but rather proceed to my closing remarks. I would like, however, just to express the hope that the chemist will recognise their theoretical importance. He will not, indeed, be surprised at the oligo-dynamic aspects of the phenomena, startling as they are. When physico-chemical factors enter into a phenomenon the influence of an infinitely small amount of material may always be expected. It is a fact, for instance, as Dr. W. H. Mills reminds me, that when a substance crystallises in more than one form it may be quite impossible to obtain the less stable forms of its crystals in any laboratory which has been "infected" with the more stable form, even though this infection has been produced by quite ordinary manipulations dealing with the latter. Here, certainly, is a case in which the influence of the infinitesimal is before us. But what I feel should arrest the interest of the chemist is the remarkable mingling of the general with the particular which phenomena like those of immunity display. In the relations which obtain between toxin and anti-toxin, for example, we find that physico-chemical factors predominate, and yet they are associated to a high degree with the character of specificity. The colloid state of matter, as such, and the properties of surface determine many of the characteristics of such reactions, yet the chemical aspect is always to the front. Combinations are observed which do not seem to be chemical compounds, but rather associations by adsorption; yet the mutual relations between the interacting complexes are in the highest degree discriminative and specific. The chemical factor in adsorption phenomena has, of course, been recognised elsewhere; but in biology it is particularly striking. Theoretical chemistry must hasten to take account of it. The modern developments in the study of valency probably constitute a step in this direction.

It is clear to everyone that the physical chemist is playing, and will continue to play, a most important part in the investigation of biological phenomena. We need, I think, have no doubt that in this country he will turn to our problems, for the kind of work he has to do seems to suit our national tastes and talents, and the biologist just now is much alive to the value of his results. But I rather feel that the organic chemist needs more wooing and gets less, though I am sure that his aid is equally necessary. In connection with most biological problems, physical and organic chemists have clearly defined tasks. To take one instance. In muscle phenomena it is becoming every day clearer that the mechanico-motor properties of the tissue, its changes of tension, its contraction and relaxation, depend upon physico-chemical phenomena associated with its colloidal complexes and its intimate structure. Changes in hydrogen-ion concentration and in the concentration of electrolytes generally, by acting upon surfaces or by upsetting osmotic equilibria, seem to be the determining causes of muscular movement. Yet the energy of the muscle is continuously supplied by the progress of organic reactions, and for a full understanding of events we need to know every detail of their course. Here then, as everywhere else, is the need for the organic chemist.

But I would urge upon any young chemist who thinks of occupying himself with biological problems the necessity for submitting for a year or two to a second discipline. If he merely migrate to a biological institute, prepared to determine the constitution of new products from the animal and study their reactions *in vitro,* he will be a very useful and acceptable person, but he will not become a biochemist. We want to learn how reactions run in the organism, and there is abundant evidence to show how little a mere knowledge of the constitution of substances, and a consideration of laboratory possibilities, can help on such knowledge. The animal body usually does the unexpected.

But if the organic chemist will get into touch with the animal, it is sure that the possession of his special knowledge will serve him well. Difficulties and peculiarities in connection with technique may lead the professor of pure chemistry to call his work amateurish, and certainly his results, unlike those of the physical chemist, will not straightway lend themselves to mathematical treatment. He may himself, too, meet from time to time the spectre of Vitalism, and be led quite unjustifiably to wonder whether all his work may not be wide of the mark. But if he will first obtain for us a further supply of valuable qualitative facts concerning the reactions in the body, we may then say to him, as Tranio said to his master:

> "The mathematics and the metaphysics
> Fall to them as you find your stomach serves you."

All of us who are engaged in applying chemistry and physics to the study of living phenomena are apt to be posed with questions as to our goal, although we have but just set out on our journey. It seems to me that we should be content to believe that we shall ultimately be able at least to describe the living animal in the sense that the morphologist has described the dead; if such descriptions do not amount to final explanations, it is not our fault. If in "life" there be some final residuum fated always to elude our methods, there is always the comforting truth to which Robert Louis Stevenson gave perhaps the finest expression, when he wrote:

> "To travel hopefully is better than to arrive,
> And the true success is labour."

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

LEEDS.—An anonymous donor has generously signified, through the Chancellor (the Duke of Devonshire), his intention of presenting to the University of Leeds the sum of 10,000*l.* for the erection of the much-needed building for the school of agriculture at the University. This gift will enable the University, in conjunction with the Yorkshire Council for Agricultural Education and with the help, it is hoped, of a grant from the Government, to provide without further delay the headquarters of agricultural education and research for the three Ridings of Yorkshire. The organisation of agricultural teaching in Yorkshire has been taken by the Board of Agriculture as the model for all other parts of England, and the rapid growth of the agricultural courses and the development of research in animal nutrition and other subjects have made it necessary to provide new buildings and laboratories on an extensive scale for the school of agriculture at the University of Leeds. The University Council has provided a site for the new building, and much of the experimental work will be done at the Manor Farm, Garforth.

MANCHESTER.—Mr. A. R. Wardle, assistant demonstrator in zoology in the Royal College of Science, London, has been appointed lecturer in economic zoology in succession to Mr. J. Mangan, who resigned at the end of last session to take up the position of assistant to the professor of biology in the Government Medical College, Cairo.

MR. W. McBRETNEY, headmaster of the Storey Institute, Lancaster, has been appointed headmaster of the new Secondary School and Technical Institute at Wallsend.

FOUR Gresham Lectures on Harvey, Darwin, and Huxley will be delivered on October 28, 29, 30, and 31, by Dr. F. M. Sandwith, Gresham professor of physic. The lectures, which will be given at the City of London School, Victoria Embankment, E.C., are free to the public, and will begin each evening at six o'clock.

IT is stated in *Science* that M. Ernest Solvay, the discoverer of the Solvay process for the manufacture of sodium carbonate, celebrated the fiftieth anniversary of that discovery on September 2 last at Brussels by giving more than 200,000*l.* to educational and charitable institutions and the employees of his firm. The Universities of Paris and Nancy each received 20,000*l.*

THE new engineering laboratories at University College, Dundee, were opened on October 14, by Sir Alexander Kennedy, F.R.S. The chair of engineering was one of the first to be established at Dundee University College, and in 1882, Prof. (now Sir Alfred) Ewing, K.C.B., was elected as its first occupant. For some few years after the foundation of the college, the facilities for the experimental teaching of engineering were meagre, and it was not until 1887 that an engineering laboratory on an adequate scale was provided. In January, 1911, the University authorities decided to build and equip a new engineering block, utilising for the purpose a grant of 10,000*l.* made by the Carnegie Trust for the development of the Scottish Universities. This department has been erected at a cost, including equipment, of about 15,500*l.* Owing to the completion in 1910 of the Peters's Electrical Engineering Laboratory, the college is well equipped for the study of this branch of engineering, and the present laboratories are devoted to the investigation of problems involved in civil and mechanical engineering. The heat-engine equipment at present includes an experimental steam engine, a gas engine, and a petrol motor, while provision is made for the installation of a Diesel oil engine and a steam turbine in the near future. The heat engine-room also contains all the apparatus necessary for the measurement of the heat value of solid and gaseous fuels, for the analysis of flue, exhaust, and fuel gases, and for the measurement of the dryness of steam, &c. The equipment of the strength of materials laboratory consists of a 50-ton Buckton single-lever testing machine, fitted for tension, compression, and cross-breaking, and with autographic recorder, an alternating stress machine, and cement testing machine, along with apparatus for determining the moduli of elasticity and rigidity, and for investigating the strength of struts and the elastic vibrations and deformations of structures. The hydraulic equipment includes a 24-in. Pelton wheel, a 9-in. inward flow pressure turbine, an electrically-driven centrifugal pump, capable of discharging 450 gallons per minute, an Oddie-Barclay high-speed differential-ram reciprocating pump, a flume, 3 ft. broad and 45 ft. long, for the study of weir and channel flow, and apparatus for studying the friction of fluids in pipes, the impact of jets, &c.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, September 29.—M. C. Jordan in the chair.—J. **Guillaume**: Observation of the occultation of the Pleiades by the moon, made September 20, 1913, with the *coudé* equatorial at Lyons Observatory.—Léopold **Fejér**: Harmonic polynomials.—H. **Tietze**: Continuous representations of surfaces on themselves.—C. **Beau**: The relations between tuberisation of roots and the attack by endophytic fungi in the course of development of *Spiranthes autumnalis*.

October 6.—M. P. Appell in the chair.—H. **Deslandres**: Remarks on the general electric and magnetic fields of the sun. A full discussion of the work of Hale in comparison with that done at Meudon by the author.—A. **Chauveau**: A comparison of human and bovine tuberculosis from the point of view of innate or specific aptitude of receiving or cultivating the bacillus. A development of views put forward in an earlier paper. The author holds that no human being, whatever the state of health, is incapable of receiving the tubercle infection, and regards this as a necessary consequence of his experiments on cattle. In the case of human beings exposed to infection and escaping, it is not the stronger subjects alone who escape. The practical conclusion is drawn that in the battle against tuberculosis, it is the bacillus which must be attacked, and hence that concentration on strengthening the vitality of the possible patient is unscientific.—R. **Lépine** and M. **Boulud**: The origin of the sugar secreted in phlorizic glycosuria. The results of experiments are cited contradicting the hypothesis that the sugar eliminated in phlorizic glycosuria arises from the renal cells. The point of attack in the kidney appears to be especially the vascular endothelium.—Charles **Depéret**: The fluvial and glacial history of the Rhône valley in the neighbourhood of Lyons. The Rhône glacier reached the Lyons region at a later period than the Quaternary epoch.—J. **Bosler**: The spectrum of the Metcalf comet, 1913*b*. Photographs taken at Meudon show a feeble continuous spectrum with three condensations corresponding to hydrocarbons (Swan spectrum) and cyanogen. It is nearly identical with the spectrum of the Schaumasse comet.—Michel **Plancherel**: The convergence of series of orthogonal functions.—Georges **Rémoundos**: Families of multiform functions admitting exceptional values within a domain.—Emile **Jouguet**: Some properties of waves of shock and combustion.—Léon **Guillet** and Victor **Bernard**: The variation of the resilience of some commercial alloys of copper as a function of the temperature. The alloys examined included seven bronzes with tin, ranging from 3·5 per cent. to 20 per cent., four brasses, and one aluminium bronze. The results are given graphically in two diagrams.—Charles **Nicolle** and L. **Blaizot**: An atoxic antigonococcic vaccine. Its application to the treatment of blennorrhagia and its complications. The authors have obtained a stable, atoxic antigonococcic serum by a method not disclosed, and give details of its curative action in a considerable number of cases.—Ch. **Dhéré** and A. **Burdel**: The absorption of the visible rays by the oxyhæmocyanines. Three reproductions of photographs of spectra are given. There would appear to be one absorption band common to