OUR BOOK SHELF.

Penrose's Pictorial Annual. The Process Year Book for 1906-7. Edited by William Gamble. (London: A. W. Penrose and Co., Ltd., n.d.)

THIS valuable and beautifully got-up volume surpasses, if possible, its predecessors. In the last few years the colour process has been rapidly coming to the front, and the present issue of this annual gives the reader an excellent insight into the good quality of the results which may be secured by the best processes of the day. The editor's task has evidently been no light one to include in this volume the wealth of material that is available, but the reader will be more than satisfied when he peruses it himself.

The arrangement of the book is the same as in former years. A most interesting series of articles dealing with process work and allied subjects is contributed, and the names of the authors are a sufficient guarantee for them. Thus, to mention only one or two cases, the editor gives a brief but clear account of the recent progress in process work, while Major-General Waterhouse describes the work of M. Léon Vidal, who, as he says, was a man who "fully recognised the educational value of photography," and who did much for its development, especially in the direction of photomechanical work, and the practical application of permanent printing processes for book illustration. M. Vidal's last contribution to this annual is contained in the present volume, and is entitled "The Future of Colour Photography when Autochrome Plates come into General Use."

Turning from the text to the illustrations, we have here also much food for thought. The frontispiece is an admirable engraving of Charles I. by the Rembrandt Intaglio Printing Co., Ltd. Of the numerous three- or four-coloured illustrations, mention may be made of those opposite p. 8, entitled "Still Life," by Messrs. John Swain and Son Ltd.; opposite p. 128, entitled "Dessert," by Messrs. H. Kollien and Co.; and following p. 136, entitled "Mimosa Blossom," by Messrs. Hood and Co., Ltd.

Einführung in die mikroskopische Analyse der Drogenpulver. By Dr. L. Koch. Pp. viii+174. (Berlin: Gebrüder Borntraeger, 1906.) Price 4 marks.

THE microscopical examination of drugs for the purpose of gaining an accurate knowledge of their constitution and of learning to detect impurities and adulterations is now recognised as a necessary part of the usual courses for pharmaceutical students, and as many chemists endeavour to acquire part of their knowledge during the term of their apprenticeship, they require books of this nature to help them in their independent studies.

Dr. Koch has prepared this elementary manual as an introduction to the specialised vegetable histology that affords the principal means of distinguishing pharmaceutical products with the aid of the microscope. A few examples of well-known drugs selected as specimens of bark, seed, and other plant products are described in detail, and the elements are figured. The instructions are so minute and thorough that a student using the book intelligently should soon become proficient in histological determination. The chapter on methods is not, however, so complete as would be expected. Although powdered preparations are generally used for investigations, it is at least desirable that the student in his training should become efficient in section-cutting. Further, a more extensive account of reagents would be helpful, for while agreeing with the substitution of chloral hydrate in place of potash, there seems no reason for leaving out potash altogether, or sulphuric acid and several other recognised testing solutions.

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LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

An Occurrence of Helium in the Absence of Radio-activity.

I MENTIONED in NATURE a few weeks ago (January 17, p. 271) that I was engaged in examining the inert gases contained in ordinary (inactive) minerals. A result has been obtained so surprising that it seems worthy of immediate record. I have found that beryl contains a quantity of helium of quite a different order of magnitude from what is found in ordinary inactive minerals. Thus 250 grams of beryl from New Hampshire gave 4.2 c.c. of helium on heating. The mineral appears to be absolutely without radio-activity. A tray of the powder, placed in the case of an electroscope of exceptionally small natural leak, did not increase that leak to any measurable extent.

It seems likely that we have here a case of rayless change. In all probability beryllium is the constituent of beryl which is concerned. It is hoped to test this view further by the comparison of different minerals.

R. J. STRUTT.

Sunnyside, Cambridge, February 19.

The Rusting of Iron.

SEVERAL letters have appeared in NATURE respecting the conditions under which iron rusts. The usually accepted view has been that iron will not rust unless carbonic acid is present. After a very careful investigation of the subject, I was led to the conclusion that provided iron, oxygen, and liquid water are brought together, chemical change takes place with the production of rust, even when every precaution has been taken to exclude even traces of carbonic acid, and that therefore some other explanation must be found for the fact that alkalis inhibit the rusting of iron. An explanation has also to be found for the fact, established in the course of this investigation, that if polished iron is immersed in a solution of potassium dichromate, rusting is completely inhibited, and the surface of the metal remains perfectly bright (Dunstan, Jowett, and Goulding, Journ. Chem. Soc., 1905).

Dr. Gerald T. Moody has recently given (Journ. Chem. Soc., 1906) an account of experiments he has made, from which he concludes that carbonic acid is essential to the rusting of iron, and that rusting does not occur in its absence.

As these experiments were made under somewhat different conditions from mine, they have been repeated. The results obtained are, however, not confirmatory of the conclusion that carbonic acid is essential to the rusting of iron.

This apparently simple chemical change requires additional experimental study, and I hope shortly to be able to make some further contribution to the subject.

February 19.

WYNDHAM R. DUNSTAN.

Ionisation and Anomalous Dispersion.

THE experiment recently described in a letter in NATURE by Dr. Schott (January 17, p. 271) does not appear to me to have any very direct bearing upon ionisation. There appears to be no question but that the changes observed in the dispersion curve were due to an alteration in the optical density gradient of the sodium vapour, resulting from local heating by the wire. The experiment is very similar to one which I made two years or more ago, during an examination of the physical properties of the vapour. A wire was stretched through the tube, along its axis, and heated by a current. The vapour was observed to be much less dense around the heated wire. The observations were made by looking through the tube either at a sodium flame, or a lamp behind bluish-green glass (for which light the vapour was very opaque). On heating the wire a clear space appeared around it. If I remember rightly, I never published this result, as the experiment was one of a series which has not, even yet, been completed.

In a sodium dispersion tube the density of the vapour

is very great along the floor, immediately above the surface of the molten metal, falling off very rapidly as the roof of the tube is approached. It has always appeared to me probable that we are dealing with clusters of molecules, though there may be some simpler way of explaining the very steep density gradient. At all events, local heating of the denser portion of the vapour reduces its density, it seems to me, to a much greater degree than would be the case with an ordinary gas. The steep density gradient only occurs when the top of the horizontal tube is cooler than the floor, that is, cool enough to condense the vapour. The tubes I usually exhaust to a pressure of a millimetre or two, and I have always found it difficult to explain how it is possible to have a layer of vapour along the floor so dense that it is deep violet in colour, while along the roof the vapour shows no trace of colour at all. On the kinetic theory, it seems to me that we should expect the vapour to be moving rapidly from the floor to the roof, without, however, showing much difference in density at different points. It may be, however, that the traces of hydrogen which are present may be the cause of the phenomenon. What we call "very dense sodium vapour" along the floor of the tube may be pure sodium vapour at a pressure of only a couple of millimetres. Along the roof we may have nearly pure hydrogen at the same pressure, and at intermediate points mixtures of the two in varying proportion, the sodium working its way up through the hydrogen and condensing on the roof. It will be well to try a very highly exhausted tube.

Upon the whole, I think perhaps this is the most conservative way of looking at the thing, though my impression is that the hot wire produces a greater reduction of density than we should expect on this assumption.

Baltimore, February 5.

R. W. Wood.

A New Chemical Test for Strength in Wheat Flour.

THAT different wheats make flours of very different baking values has been known for a long time, and is emphasised by the fact that English millers are at the present time paying several shillings per quarter more for certain foreign wheats than for home-grown wheat.

Baking value, or strength as the millers and bakers call it, is a subject of much interest, and many workers have tried to connect it with some definite physical or chemical property of the grain or flour. Thus it has been stated to depend on the percentage of gluten, the percentage of gliadin, or the ratio of gliadin to gluten.

None of these explanations has been found to meet all cases, nor is there any likelihood of finding any single factor which is capable of measuring so composite an idea as strength as understood by the miller or baker.

The value of a flour to the baker depends on at least four distinct properties:—(1) the volume of the loaf a given quantity will produce, which may vary more than 30 per cent.; (2) the amount of water which a given quantity will absorb in making a dough of proper consistency for baking, which may vary from one-half to three-quarters of its own weight; (3) the shape of the loaf; and (4) such points as texture and colour of the bread.

The baker, and apparently most of those who have attacked the problem, have confused these widely divergent properties under the single name of strength, and attempted to find one chemical or physical factor which will measure them all at once.

In taking up this subject, it seemed to me that the most hopeful line was to treat each property as a separate problem, and as the question of size of loaf seemed simplest, I have for the most part confined my attention to that aspect of the investigation.

In converting a given amount of flour into a loaf of bread, the flour is mixed with water and yeast, and allowed to ferment for some time. It is then put into the oven and baked. The yeast finds sugar in the flour, feeds on this, and converts it into alcohol and carbon dioxide, and the volume of the loaf must depend either on the volume of carbon dioxide evolved, or on the power of the flour to hold this gas.

To test this a number of flours were obtained from Mr. A. E. Humphries, chairman of the Millers' Association,

who had kindly tested them in the bakehouse, and determined their strength. The scale of strength adopted is a purely arbitrary one. The mark 100 is assigned to the best flour on the market, and 0 to a flour which is quite unbakeable.

In each experiment 20 grams of flour were mixed with 20 c.c. of water and half a gram of standard yeast, incubated at 35° C., and the carbon dioxide liberated directly measured. The results are appended:—

Reference No.	Baking value or "strength"	CO ₂ evolved cc.
1	96	270
2	90	325
3	73	274
4	68	227
5	65	205
6	45	156
7	36	131
8	20	287

It will be seen that with the exception of Nos. 1 and 8 the order of strength and of carbon dioxide evolved are the same. Perhaps the greatest confirmation of the idea that strength is directly dependent upon the capacity of a flour for acting as yeast food is found in the apparent exceptions. On inquiry from Mr. Humphries, I learned that the high mark assigned to flour No. 1 was based upon bakings made after the addition of malt extract, while the low value given to No. 8 was based on baking tests made some months earlier. The high carbon dioxide value actually found for the latter enabled me to predict that the flour must have changed in composition so as to have gained in strength, and this prediction was verified. On baking again it was marked 40, with the report that it made a large loaf, and would have been marked higher but for the bad shape.

The quantity of carbon dioxide given off by a dough will depend upon two things—the sugar present as such in the flour, and the diastatic capacity. Analysis showed that in the flours experimented with the sugar present varied from 2.56 per cent. in the strongest to 1.60 per cent. in the weakest, and followed very closely the order of strength throughout the series. Diastatic capacity has not yet been thoroughly examined.

The addition of sugar to flour was found always to increase the volume, the weight, and the height of the loaf. In a typical experiment made with household flour the increases were as follows:—volume, 13 per cent.; weight, 2 per cent.; and height, 30 per cent.

These experiments seem to prove conclusively that the volume of the loaf depends in the first instance upon the amount of sugar available in the dough, and a ready test is thus provided for that aspect of strength which is concerned with the size of the loaf. The other factors included in strength are at present under investigation.

T. B. Wood.

Department of Agriculture, Cambridge.

The Flight of an Elongated Shot.

WITHIN the limits of accuracy of this discussion, it may be assumed that the sections of the shot normal to its axis of figure are circular, that its C.G. is in the axis of figure, and that this axis and all the diameters of the circular section at the C.G. give the directions of the principal axes of inertia at the C.G. Angular momenta will be referred to the C.G., the axis of the shot will be called simply the axis, and all directions will be understood as viewed from behind the shot.

The chief disturbing forces are the normal pressures of the air, the frictional forces being of a secondary order of magnitude. These normal pressures will be at a maximum upon the ogival head of the shot. The areas of such relatively smaller pressures as are due to vortex motion in the air, and to the partial vacua set up behind advancing surfaces directly presented to and against the air, will be situated towards the base of the shot, and upon the upper or the lower side of the shot, according as the axis is pointed above or below the tangent to the path of the C.G., i.e. the tangent to the trajectory.

Now, from the first moment of the free motion the tangent to the trajectory falls away more and more from the axis of the shot. The immediate result of this is the