Conclusion. Au cours de régimes pauvres en protides, entraînant la régression du pancréas exocrine, on observe une surcharge en fer de l'extrémité supérieure des villosités intestinales, visible sous forme de fines granulations donnant la réaction du bleu de Prusse dans le pôle apical des entérocytes et de grosses granulations à l'intérieur de macrophages dans l'axe conjonctivo-vasculaire.

La réaction phosphatasique alcaline se montre négative dans le plateau strié des entérocytes du sommet des villosités.

Les cellules A des ilôts de Langerhans présentent une diminution de leur activité se traduisant par la disparition à leur niveau de la réaction du tryptophane.

Summary. During the regression of exocrine pancreas caused by a diet poor in protides, an organic iron compound accumulates at the end of intestinal villi: small granules in the upper part of enterocytes, larger particles in macrophages of the connective axis. Alkaline phosphatase activity disappears from the striated border of the enterocytes concerned.

J. Verne et S. Hebert

Institut National de la Santé et de la Recherche Médicale, Faculté de Médecine de Paris (France), le 24 mars 1966.

Relative Velocity of the Division Cycle in Sister Cells

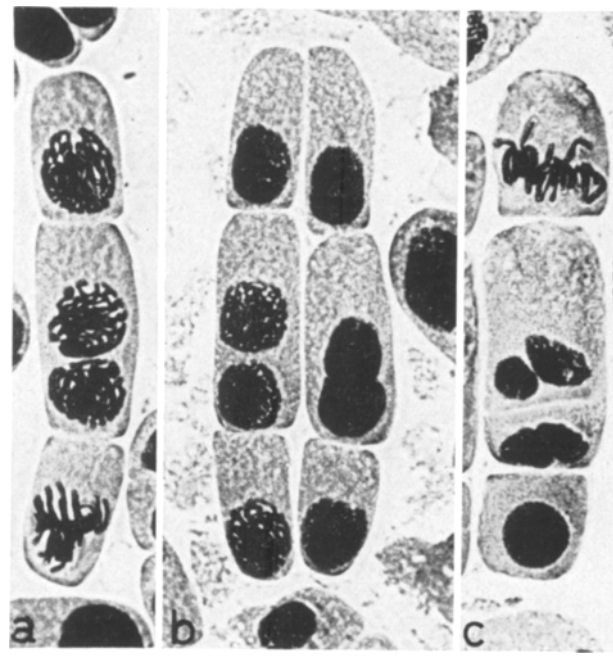
Observation shows that a meristem consists of a number of cells developing, whether they are in process of division or in interphase, to all appearances in a completely unsynchronized fashion. There seems to be no plan regulating the successive divisions that take place in the several layers of cells as they approach the tip. In spite of this, a certain sequence was observable in the duration of the division cycle in sister cells, of which we gave some account in a recent study of the division cycle by means of labelling with caffeine[1], which we have followed up with a further study, using the centrifugation of the roots so as to mark the position of each cell in relation to the tip, and so elucidate the problem by checking whether or not there is any sequence in the divisions taking place.

Method. Labelling with caffeine gives us a population of binucleate cells (binucleates of the first order) whose development gives rise to a population that is in the course of bimitosis (of the first order)[1,2]. The results of the first-order bimitoses is that we have 2 lateral diploid cells and 1 binucleate in the centre (second-order binucleate cell). After squashing, these 3 sister cells, formed at the same time, remain together and form a block ($2n;2n+2n;2n$). Their further development gives rise to a normal mitosis in each outside cell and a bimitosis (of the second order) in the middle cell.

Onion bulbs (*Allium cepa*) were grown in the dark at a temperature of 25° ± 0.5 °C in cylindrical glass receptacles of about 70 cm³ capacity, with tap-water renewed every 24 h and continually aerated by bubbling at the rate of 10–15 cm³ air/min.

The roots were 1.5–2 cm long at the beginning of the experiment. They were put in without separating them from the bulbs and were immersed in a 0.1% caffeine solution for 12–15 h, after which they were washed and reimmersed in tap-water, thereby obtaining an initial proportion of 40–60% of binucleate cells. About 30 h after the end of the treatment, a great deal of second-order bimitosis was observed. Then, in order to be able to spot the relative positions of these 3 cells in the meristem, we resorted to centrifugation of the onion bulb with its roots intact, with the meristems pointing towards the centrifugal pole. Treatment of 1500 *g* for 30 min was sufficient to direct the nuclei towards the centrifugal pole, and the position of the cells in the block in relation to the root tip is thus discernible after squashing. After centrifuging, the preparations are fixed and stained according to the squash technique of Tjio and Levan[3].

Results and discussion. Development of the mononucleate cells of the block 2n;2n + 2n;2n. If we call the outside mononucleate Cells E_1 and E_2, E_1 being the one nearer to



Blocks ($2n;2n+2n;2n$) originated from coaxial bimitoses of first order. After centrifuging, the position of the nuclei indicates the orientation of the blocks in the root in regard with the tip. The bottom cells were the nearest to the apex. (a) and (b): In these cases the nearest mononucleate cells to the apex were the fastest (E_1, E_2). In the middle binucleate cells the nuclei are at biprophase, early biprophase and interphase, respectively. (c) In this case the mononucleate cell farthest away from the tip was the fastest (E_1, E_2). In the middle cell a parallel bitelophase can be observed.

[1] A. González-Fernández, J. F. López-Sáez, and G. Giménez-Martín, Exp. Cell Res. (1966), to be published.

[2] G. Giménez-Martín, A. González-Fernández, and J. F. López-Sáez, J. Cell Biol. *26*, 305 (1965).

[3] J. H. Tjio and A. Levan, Ann. estac. Exp. Aula Dei *2*, 21 (1950).

the root tip and E_2 the one farther away from it, the results show an advantage in favour of the former as far as the duration of the division cycle is concerned.

We notice in Table I that the mononucleate cell nearer to the tip shows a shorter division cycle in 72.3% of the cases observed, whereas the farther cell goes through its cycle in a shorter time in only 27.6% of the cases. If the average duration of the division cycle were the same for both, each of the cells would come out as the faster in 50% of the cases. The clear deviation from this norm suggested to us that these cells go through their cycle faster or slower according to their position with respect to the root tip, the cell that is farther away having a longer division cycle than the nearer one.

Development of the sister cells in the mononucleate population. In order to confirm these results, and to avoid the complications introduced by a treatment with caffeine, we carried out the same experiment with sister cells, which generally remain joined together in pairs after they have been squashed. These cells were also formed synchronously, being daughter cells from one mitosis.

In Table I we give the results of this study, and it may be observed that in 72.4% of the cases the cell nearer to the tip goes through its cycle in a shorter time than the other.

We may therefore admit a certain gradation in the duration of the cycle, from the initial cells with a short duration up to the differentiated cells with a theoretically infinite duration. The duration probably increases 'pari passu' with the gradually increasing differentiation of the cells as we go up the meristem. It is curious to note that the difference of duration in the cell division cycle can be detected even in sister cells which are separated from the initial cells by very similar distances.

It was logical to suppose that the meristematic population in the proximity of the initial cells shows this gradation only very slightly and that the sister cells go through the cycle in about the same time, each being as likely to be the faster as the other, whereas the cells farthest away from the initial ones and the nearest to the area of differentiation show the gradation in a more marked manner.

In order to test this hypothesis the following experiment was carried out. After centrifugation, the roots were fixed and stained. The meristematic region, about 2 mm, was transversally divided into 2 equal parts which were squashed in the same slide but with different coverslips. The portion including the tip was labelled A and that nearer to the differentiation region D.

The results obtained (Table II) are apparently in agreement with our hypothesis. All the roots studied showed a more marked gradation in the zone D than in the zone A. Therefore, the different duration of the division cycle of sister cells becomes more marked when these are further away from the apex, i.e. when they are nearer to the differentiation region.

Table I

E_1-B-E_2 *2n;2n + 2n;2n*				M_1-M_2 *2n-2n*			
Order	No. of cases	%	S.E.	Order	No. of cases	%	S.E.
E_1 E_2	81	72.3	± 11.0	M_1 M_2	767	72.4	± 6.7
E_2 E_1	31	27.6		M_2 M_1	291	27.5	

Blocks (left) and sister cells (right) observed in division according to the sequence of letters; the first letter symbolizes the faster cell and the second stands for the slowest cell. (E_1 = diploid mononucleate cell at the end of the block nearest to the root tip, E_2 = diploid mononucleate cell of the block farthest away from the root tip, M_1 = diploid mononucleate cell from a group of two sister cells nearest to the apex, and M_2 = diploid mononucleate cell farthest away from the root apex). S.E. = standard error.

Table II

Order	Region A			Region D			Total		
	No. of cases	%	S.E.	No. of cases	%	S.E.	No. of cases	%	S.E.
M_1 M_2	722	62.4	± 3.6	455	76.5	± 4.4	1177	67.1	± 4.3
M_2 M_1	435	37.5		139	23.4		574	32.8	

(See the legend of Table I and the last two paragraphs of the text.)

Resumen. En los meristemos radicales (en columna) las células hermanas poseen ciclos mitóticos de distinta duración según su posición con respecto al ápice. La célula hermana más próxima al ápice posee un ciclo ligeramente más corto que la otra. Se sugiere la existencia de un gradiente de la duración del ciclo desde las células iniciales hasta las células de la región de diferenciación.

J. F. LÓPÉZ-SÁEZ, G. GIMÉNEZ-MARTÍN, and A. GONZÁLEZ-FERNÁNDEZ

Instituto de Biologia Celular, C.S.I.C., Madrid-6 (Spain), March 15, 1966.

Zum Mechanismus der Propandioldehydrase-Reaktion

Unter der Einwirkung der Propandioldehydrase aus *Aerobacter aerogenes* (ATCC 8724) und in Gegenwart des α-(Dimethylbenzimidazolyl)-Co-5'-deoxyadenosylcobamids werden die beiden Enantiomeren des Propan-1,2-diols zu Propionaldehyd umgewandelt[1]. Es steht fest, dass während der Reaktion stereospezifische Wanderung eines Wasserstoffatoms von C-1 nach C-2 erfolgt[2], wobei bei dem (*R*)-Isomeren spezifisch das H_R-Atom[3], bei dem (*S*)-Isomeren hingegen das H_S-Atom[3] zur Wanderung gelangt[4,5]. Die Wanderung erfolgt durch intermediäre Übertragung des Wasserstoffatoms auf das Coenzym[6] und findet in beiden Fällen unter Konfigurationsumkehr am C-2 statt[4,7]. Nachfolgend berichten wir über Versuche mit ^{18}O-markierten Substraten, die neues Licht auf den Mechanismus dieser Reaktion werfen.

Angereicherte Proben von (*R*)- bzw. (*S*)-1-^{18}O-Propan-1,2-diol, **1** bzw. **2**, wurden durch Äquilibrierung der ent-