CH_3SiCl_3, $(CH_3)_2SiCl_2$. $C_2H_5SiCl_3$, $(C_2H_5)_2SiCl_2$, n – $C_3H_7SiCl_3$, $(n - C_3H_7)_2SiCl_2$, i – $C_3H_7SiCl_3$, $(i - C_3H_7)_2SiCl_2$, $CH_2 = CHCH_2SiCl_3$, $(CH_2 = CHCH_2)_2SiCl_2$, n – $C_4H_9SiCl_3$, i – $C_5H_{11}SiCl_3$, $(i - C_5H_{11})_2SiCl_2$, n – $C_6H_{11}SiCl_3$, $(n - C_6H_{11})_2SiCl_2$, $(CH_2)_6SiCl_3$, $[(CH_2)_6]-]_2 - SiCl_2$, $[(CH_2)_6]_3SiCl$, n – $C_{12}H_{23}SiCl_3$, $C_6H_5SiCl_3$, $(C_6H_5)_2SiCl_2$, $C_6H_5CH_2SiCl_3$, $(C_6H_5CH_2)_2SiCl_2$, $(C_6H_5CH_2)_3SiCl$, $(p - CH_3C_6H_4)_2SiCl_2$, p – $C_2H_5OC_6H_4SiCl_3$, p – $ClC_6H_4SiCl_3$, p – $CH_3OC_6H_4SiCl_3$, a – $C_{10}H_7SiCl_3$.

Εἰς πάσας τὰς ὡς εἴρηται περιπτώσεις ἀπεδείχθη δυνατὴ ἡ δι' ἀμμωνολυτικῶν ἀντιδράσεων παρασκευὴ σταθερῶν διαλυμάτων τῶν διαμέσων πολυμερῶν τῶν ἀμινοσιλανίων. Τὰ διαλύματα ταῦτα ἐλήφθησαν τῇ βοηθείᾳ ὀργανικῶν διαλυτικῶν ὑγρῶν. Μερικὰ ἐκ τῶν οὕτωσὶ παρασκευασθέντων διαλυμάτων καταλείπουσι δι' ἠπίας ἐξατμίσεως τοῦ διαλυτικοῦ μέσου λεπτοὺς ὑμένας (films), οἵτινες πολυμεροῦνται ταχέως καὶ δὴ εἰς τὴν θερμοκρασίαν τοῦ περιβάλλοντος καὶ ὑπὸ ταὐτόχρονον ἔκλυσιν ἀμμωνίας. Ἄλλα πάλιν ἐκ τῶν εἰρημένων διαλυμάτων εἶναι κατάλληλα, ὅπως ἐξ αὐτῶν ἀποτεθῶσι σταθεροὶ καὶ ἐλαστικοὶ ὑμένες οὐχὶ μόνον ἐπὶ ἰνωδῶν ὑλικῶν, ὡς αἱ ὑφάνσιμοι ὕλαι καὶ τὰ δέρματα, ἀλλ' εἰσέτι καὶ ἐπὶ τῆς ὑάλου, τῶν μετάλλων καὶ διαφόρων ἄλλων ἐπιφανειῶν. Οἱ ὑμένες οὗτοι περιέχουσι σημαντικὴν ποσότητα ἀζώτου, ὡς τοῦτο καταδεικνύεται διὰ τῆς χημικῆς αὐτῶν ἀναλύσεως. Τὸ γεγονὸς τοῦτο ἀποτελεῖ τὴν ἀπόδειξιν, ὅτι ἡ ὑδρόλυσις τῶν ἀμινοσιλανίων πρὸς τὰ ἀντίστοιχα πολυοξυσιλάνια λαμβάνει χώραν μόνον ἐπὶ τῶν ἐξωτερικῶν ἐπιφανειῶν, αἵτινες εἰσιν αἱ ἀμεσώτερον ἐκτεθειμέναι εἰς τὴν ὑγρασίαν τοῦ περιβάλλοντος ἀέρος. Εἶναι προφανὲς ὅτι ὁ μεταξὺ πυριτίου καὶ ἀζώτου δεσμὸς Si–N–Si ἅπαξ σχηματισθεὶς δὲν διασπᾶται ἐφεξῆς εὐκόλως.

(*Σημ.* Αἱ ὡς ἄνω ἔρευναι ἐγένοντο ὑπὸ τοῦ καθηγητοῦ κ. Ν. Δ. Τσερώνη καὶ τῶν συνεργατῶν αὐτοῦ ἐν τῷ Ἐργαστηρίῳ συνθετικῶν ἐρευνῶν τοῦ Σικάγου).

ΒΙΟΛΟΓΙΑ.— **Experiences from transplantation experiments on 10 Drosophila species,** *by A. Kanellis and A. E. Stubbe**. Ἀνεκοινώθη ὑπὸ τοῦ κ. Σπ. Δοντᾶ.

Besides gene-analysis, the origin of species has always been a main subject of Genetics. The possibility to solve this problem will increase along

*Α. ΚΑΝΕΛΛΗ καὶ Α. Ε. STUBBE: Πορίσματα ἐκ πειραμάτων μεταφυτεύσεως ἐπὶ 10 εἰδῶν Δροσοφίλου.

with our improved knowledge and our ability to define the term «species». Therefore it is the aim of everybody, interested in the problem of development of species, to work farther and farther on the knowledge of what are the differences between species, and to persue to the very last, by which biological manifestations they may be expressed. In many ways Drosophila seems to be the right subject for these investigations, and therefore it may be hoped for, that Drosophila that gave us so valuable knowledge about Genetics in general, may also do so regarding the problem of species. By its about 300 species Drosophila offers a rich material, that can be successfully worked on in different directions. Besides the morphological and ecological comparison, especially investigations of the cytology — above all the observation of the giant chromosomes of the salivary glands — and the developmental physiology are promisssing.

From 1940 to 1944 we carried out a number of investigations regarding the mentioned subject. From the interesting and important field of gene hormons we chose the eye color substances as the hitherto best known, in order to obtain by transplantations of the eye discs between the wild types of 10 Drosophila species and the wild type of Drosophila melanogaster a possibility to compare the content of eye color substance within these Drosophila species with Drosophila melanogaster, and thereby also among these species themselves.

Beadle and *Ephrussi* (1936) developed a method for transplantation of organ-Anlagen in Drosophila. They discovered by their experiments that three gene hormons are necessary for the development of normal eye color in the wild type of Drosophila melanogaster. They named them ca^{+}–, cn^{+}–, and v^{+}– substances from three light eyed mutants — claret, cinnabar and vermilion — who are lacking the respective eye color substances, which would be necessary to allow their eye discs to develop the normal wild type color (+). *Butenandt, Weidel* and *Becker* (1940) stated that v^{+}– substance is identical with pure kynurenin. Also the less investigated ca^{+}– and cn^{+}– substances are tryptophane derivatives.

We investigated the wild types of the following Drosophila species:

1.	Dros.	funebris	«England 2»	(+ f)
2.	»	virilis	U. S. A.	(+ vi)
3.	»	simulans	Austin, Texas	(+ sa)

4.	Dros.	immigrans	«Italica»	(+ im)
5.	»	azteca	«Cuenavaca»	(+ az)
6.	»	repleta	«Pavia»	(+ rp)
7.	»	hydei	«Catania»	(+ hy)
8.	»	buskii	«Berlin - Buch»	(+ bu)
9.	»	miranda	«Königsberg»	(+ mir)
10.	»	phalerata	«Berlin - Buch»	(+ ph)

As control served the wild type of Drosophila melanogaster «Berlin wild» (+m). Besides the following mutants we have used also double recessive compounds (for special tests on eye color substances):

ca = claret	bw = brown
v = vermilion	ca ; w^e = claret-eosin
cn = cinnabar	v ; bw = vermilion-brown
w^e = eosin	cn bw = cinnabar-brown [1]

Except in Dros. simulans and Dros. phalerata, the eye color of wild type imagines of all investigated Drosophila species differ from the wild type of Dros. melanogaster. The imagines of Dros. immigrans and Dros. azteca have lighter, and the other 6 species have darker eyes than Dros. melanogaster. However, if autonomous implant eyes of Dros. melanogaster are compared with likewise autonomous implant eyes of the investigated species, (Fig. 1) the implant eyes of all species show the same color as the melanogaster implant eyes, except Dros. buskii and Dros. miranda. In these two species the implant eyes are also markedly darker than in Dros. melanogaster. (The implants are normally developed eyes, but they are invert, i. e. the pigment is on the surface. This allows a direct comparison, whereagainst the pigment in normal imago eyes is looking through from inside the eye). Because of this fact we can conclude, that only Dros. buskii and Dros. miranda really have darker eyes than Dros. melanogaster, as their implant eyes proove. The darker imago eyes of the other species are due probably to structural elements, independant from the pigment.

As it is further shown in fig. 1, all tested species, except Dros. virilis, are autonomous in + (m) hosts. + (vi) implants become markedly darker in + (m)

[1] Please see description of our methods from publications, named in the list of literature.

hostes than the + (m) - in - + (m) controls. The same can be observed on + (vi) implants in other melanogaster hosts, namely in the mutants ca, v and cn. Obvious virilis implants generally develop specially dark within melanogaster hosts. The most reasonable explanation seems to be, that the color substrate within the virilis eyes is sensitized by the melanogaster lymphe, i.e. the substrate is stimulated to develop a darker pigment. + (m)

HOST / IMPL.	+M	+F	+VI	+SA	+IM	+AZ	+RP	+HY	+BU	+MIR	+PH
+M	○	○	○	○	○	○	○	⊙	○	⊙	○
+F	○	○									
+VI	◉		○								
+SA	○			○							
+IM	○				○						
+AZ	○					○					
+RP	○						○				
+HY	○							○			
+BU	⊙								⊙		
+MIR	◉									⊙	
+PH	○										○

Fig. 1.

The behaviour of + (m) - and other wild type implants within + (m) hosts and host of their own species.

○ = The implant develops autonomous, its color is like + (m) - in - + (m) controls.

⊙ ⊙ ◉ = The implant develops a darker color than the + (m) - in - + (m) controls.

implants are autonomous in all tested species except Dros. hydei and Dros. miranda. In the wild type of these two species + (m) implants become darker than + (m) - in - + (m) controls. Here may be a special color developing effect of the + (hy) and the + (mir) lymphe is working on the + (m) implants.

When the behaviour of ca-, v-, and cn-eye discs within the wild type of the different species is tested (Fig. 2), the degree of color developed

by them in these hosts, compared with the wild type of melanogaster (supported by the behaviour of the ca; w^e-, v; bw -, and cn bw-implants) shows clear differences in the amount of eye color substances. In +(m) hosts the ca(m) implants remain unchanged in color, while v(m) and cn(m) implants develop the full wild type color. Except Dros. simulans, all other species behave different. ca-implants develop whithin +(vi) -, +(im) -, +(bu) , and +(ph) hosts as in +(m) hosts, but not v or cn implants. In +(vi) hosts v implants remain a little lighter than the +(m) - in +(m) - controls

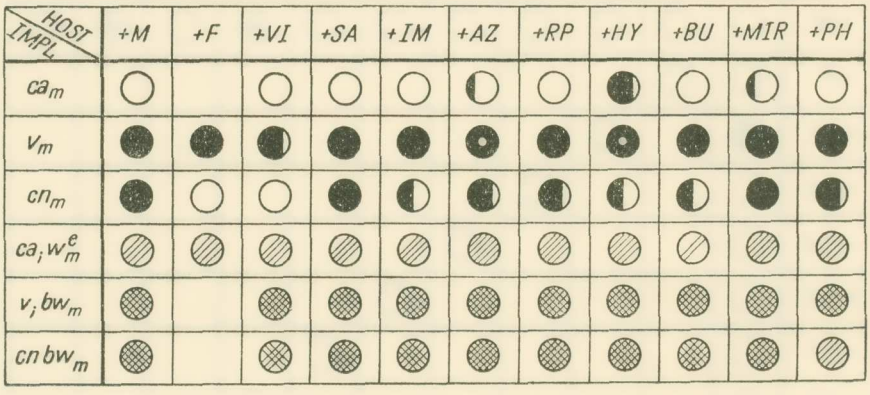

Fig. 2.

Different wild types as hosts for three melanogaster mutants and mutation - compounds.

○ =The implant develops autonomous.

● =The implant develops heteronomous.

◉ =The implant reachesa darker color than the corresponding to autonomous development.

Black - and - white circles: The implant develops an intermediate color degree.

Hatched circles: Different degrees of color.

and cn implants do not reach the full wild type color within any of the tested species, except within +(sa) and +(mir) hosts. In +(vi) hosts they remain so light as the cn - in - cn controls, and in +(im) , +(rp), +(bu) -, and +(ph) hosts different intermediate color degrees are reached. In +(az) -, +(hy) -, and +(mir) hosts cn implants become darker than the cn in cn controls, a very dark color is developed within +(hy) hosts. v(m) - and cn(m) implants behave within +(mir) hosts as in +(m) hosts. In +(az) - and (hy) hosts v(m) implants develop a darker color than the +(m) - in +(m) controls, while cn implants reach an intermediate color degree between the color of cn (m) - in - cn (m) - and +(m) - in - +(m) controls. The species

funebris was treated in a somewhat different way, but even though a comparison is possible. v (m) implants develop full wild type color within + (f) hosts, cn (m) implants remain unchanged. However, the special test on cn$^+$ sub-tance showed a light yellow color of the cn bw implants in +(f) hosts, compared with the colorless cn bw - in cn bw controls. This indicates, that the + (f) hosts contain a minor amount of cn$^+$ substance. The special test on ca$^+$ substance shows the same result in + (m) and in + (f) hosts, namely a very slight contain of ca$^+$ substance.

This shows, that the investigated species differ from each other in the amount of eye color substances, and that species who have a similar morphology, as f. inst. Dros. hydei and Dros. repleta, or even those which can be mated, as f. inst. Dros. melanogaster and Dros. simulans, also show a similar behaviour regarding the color development of their eye discs (Tab. 1).

TABLE 1.

Amount of eye color substances in the wild types of the tested species compared with the wild type of Dros. melanogaster.

Tested species	ca$^+$ substance + (m)	v$^+$ substance +(m)	cn$^+$ substance +(m)
Dros. funebris	—		
» virilis	—	=	
» simulans	—	=	=
» immigrans	=		
» azteca			
» repleta		=	
» hydei			
» buskii			
» miranda			
» phalerata	=		

In fig. 3 is shown the behaviour of wild type implants from the different species in ca (m) , v (m) , and cn (m) hosts. Thereof we can draw conslusions both about the conditions of gene hormons within the donor larvae of the implants and about the implants capacity to take up eye color substances and their need of them. If a wild type implant within a host, that is lacking one or more of the eye color substances, succeeds to develop

the full wild type color, the only explanation for this is that the eye disc was charged before the transplantation with a sufficient amount of gene hormone. If this is not possible, either because the haemolymph of the donor larvae did not contain sufficient gene hormone, or because the time before the transplantation was too short to allow the eye disc to take up enough eye color substance, then the normal color degree of the wild type eye will not be reached. But it may also happen that the implants reach a still darker color than that corresponding to either auto - or heteronomous development. In these cases the reason may be, that certain implants react very

IMPL / HOST	+M	+F	+VI	+SA	+IM	+AZ	+RP	+HY	+BU	+MIR	+PH
ca_m	◐		●	○	◐	⊙	◐	⊙	⊙	⊙	◐
v_m	◐	○	●	◐	◐	◐	◐	○	⊗	⊗	◐
cn_m	○	○	●	○	●	⊙	○	●	⊗	●	○

Fig. 3.

The behaviour of different wild type implants within three melanogaster mutant hosts.

○ = The implant develops autonomous.

◐ = The implant develops nearly autonomous. (It remains a little lighter than the + (m) - in - + (m) controls).

⊗ = The nearly autonomous color development of + (bu) - and + (mir) implants. The reach the color of + (m) - in - + (m) controls).

● ⊙ = The implant reaches a darker color than corresponding to either autonomous or heteronomous development. (For + (bu) - and + (mir) implants = autonomous color development).

strongly with an eye color substance, i. e. they need only a little amount of gene hormone to reach the normal color degree. If we assume, that the implants are able, — when more is offered, - to develop a pigment, darker than normal, then the specially dark color, that some implants develop within cn (m) hosts, might be explained by a larger supply of v⁺ substance, which the cn host (opposite to the wild type host) does not use up itself. So f. inst. + (sa) , + (bu) - and + (mir) implants behave autonomous within ca (m) hosts, while the wild type implants of the other species do not quite reach their autonomous color, except + (az) , + (vi) , and + (hy) implants, who develop a still darker color than their normal wild type eyes. In v (m) hosts + (f) - and + (hy) implants develop autonomous, + (vi) implants develop a

specially dark color, and all others remain a little lighter, than their normal wild type color. In ca (m) hosts we meet autonomous color development in + (m) , + (f) -, + (sa) -, + (rp) and + (ph) implants, only + (bu) implants remain a little lighter, than the + (bu) in + (bu) controls. + (vi) -, + (im) , + (az) , + (hy) , and + (mir) implants develop a darker color than the respective controls.

Besides the above described, we found certain other differences, which could not as yet be determined. They are merely expressed by the developmental ability of melanogaster implants in the wild types of other species. Thus f. inst. melanogaster implants always develop very poorly within + (vi) , + (hy) , + (bu) and + (ph) hosts.

Finaly it can be said, that the 10 Drosophila species, that we investigated, not only differ morphologically and cytologically, but that they also show both quantitative and qualitative differences in a physiological respect. Biochemical investigation of the eye discs, the full developed pigments and the haemolymphs in the different species, would very probably make it possible to trace still finer differences. And this work could very well be carried out, in spite of the small size of the subject. Furthermore the systematical transplantation of other imaginal discs than the eye discs might reveal the mode of action of morphogenic substances within the different Drosophila species.

Further transplantation work on Drosophila together with morphological, cytological and biochemical studies, would be a valuable aid to increase our knowledge about the differences of species and thereby about the biological category «species» itself.

ΠΕΡΙΛΗΨΙΣ

1. Ὁ χρωματισμὸς τῶν ὀφθαλμῶν τοῦ συνήθους τύπου τῆς Dr. melanogaster ὀφείλεται εἰς τὴν παρουσίαν τῶν γονιδιακῶν ὁρμονῶν ca^+, v^+ καὶ cn^+.

2. Διεξήχθησαν πειράματα μεταφυτεύσεως ὀφθαλμικῶν δίσκων μεταξὺ δέκα εἰδῶν τοῦ γένους Drosophila καὶ τῆς Dros. melanogaster καθὼς καὶ τῶν ca, v, cn, bw, ca; w^e, v; bw καὶ cn bw μεταλλάξεων ἢ συνδυασμοῦ μεταλλάξεων αὐτῆς, μὲ σκοπόν, ὅπως ἐκ τοῦ ποσοῦ τῶν περιεχομένων ἐντὸς αὐτῶν γονιδιακῶν ὁρμονῶν καθορισθοῦν αἱ βιοχημικαὶ διαφοραί, αἱ ὁποῖαι ὑφίστανται μεταξύ των.

3. Μεταφυτεύσεις μεταξὺ ἀτόμων τοῦ αὐτοῦ εἴδους ἀπέδειξαν ὅτι, ἐξαιρέσει

τῆς Dr. buskii καὶ τῆς Dr. miranda, οἱ ἐκ τῶν μεταφυτευμάτων ἀναπτυσσόμενοι ὀφθαλμοὶ ἔχουν τὸ χρῶμα τῶν ὀφθαλμῶν τῶν συνήθων ἀτόμων τῆς Dr. melanogaster (εἰκ. 1).

4. Ὁ συνήθως παρατηρούμενος διάφορος χρωματισμὸς τῶν ὀφθαλμῶν ὀφείλεται εἰς ἄσχετα πρὸς τὰς χρωστικὰς αἴτια.

5. Μεταφυτεύσεις, κατὰ τὰς ὁποίας ὡς ξενιστὴς ἐχρησιμοποιήθη ὁ συνήθης τύπος τῆς Dr. melanogaster, ἀπέδειξαν ὅτι οἱ ὀφθαλμικοὶ δίσκοι τῶν ἐξετασθέντων εἰδῶν, πλὴν τῆς Dr. virilis, ἀναπτύσσονται αὐτονόμως (εἰκ. 1).

6. Ὁμοίως, ὅταν ὡς ξενισταὶ ἐχρησιμοποιήθησαν τὰ διάφορα εἴδη τῆς Drosophila, εὑρέθη ὅτι ἐντὸς τούτων οἱ ὀφθαλμικοὶ δίσκοι τῶν συνήθων ἀτόμων τῆς Dr. melanogaster ἀναπτύσσονται ἐπίσης αὐτονόμως. Ἐξαίρεσιν ἀποτελοῦν ἡ Dr. hydei καὶ ἡ Dr. miranda (εἰκ. 1).

7. Μεταφυτεύματα τῶν ὀφθαλμικῶν δίσκων τῶν μεταλλάξεων ca, v, cn, ca; w^{e}, v; bu καὶ cn bw τῆς Dr. melanogaster ἐντὸς τῶν συνήθων τύπων τῶν ἐξετασθέντων εἰδῶν ἀναπτύσσονται κατὰ διάφορον τρόπον (εἰκ. 2).

8. Ἀντίθετοι μεταφυτεύσεις κατὰ τὰς ὁποίας ὡς ξενισταὶ ἐχρησιμοποιήθησαν αἱ μεταλλάξεις ca, v καὶ cn κατέδειξαν ὅτι ἐντὸς αὐτῶν τὰ μεταφυτεύματα ἄλλοτε ἀναπτύσσονται αὐτονόμως, ἄλλοτε ὑστεροῦν τοῦ κανονικοῦ χρώματος καὶ ἄλλοτε χρωματίζονται ἐντονώτερον (εἰκ. 3).

9. Ἐκ τῆς συγκρίσεως τῶν ἀποτελεσμάτων προκύπτει ὅτι τὰ ἐξετασθέντα εἴδη πλὴν τῆς μορφολογικῆς καὶ κυτταρολογικῆς διαφορᾶς των, διαφέρουν ἐπίσης μεταξύ των καὶ ὡς πρὸς τὸ ποσὸν καὶ τὸ ποιὸν τῶν βιοκαταλυτικῶν χρωστικῶν τοῦ ὀφθαλμοῦ, τὰς ὁποίας περιέχουν. Μορφολογικῶς ὅμοια εἴδη, ὡς εἶναι ἡ Dr. hydei καὶ ἡ Dr. repleta, ἢ εἴδη τὰ ὁποῖα διασταυροῦνται μεταξύ των, ὡς εἶναι ἡ Dr. melanogaster καὶ ἡ Dr. simulans, δεικνύουν μικροτέρας διαφορὰς (πίναξ 1).

LITERATURE

Beadle G. W. and *B. Ephrussi,* 1937 : Development of eye colors in Drosophila: Diffusible substances and their interrelations. Genetics, **22**, 76.

Butenandt A, W. Weidel u. E. Becker, 1940: Kynurenin als Augenpigmentbildung auslösendes Agent bei Insekten. Naturw., **28**, 63.

Ephrussi B. and *G. W. Beadle,* 1936: A technique of transplantation for Drosophila. Amer. Nat., **70**, 218.

Vergleichende Untersuchungen der Wildtypen verschiedener Drosophila Arten an Hand von Transplationen der Augenanlangen :

I. Vergleich der Wildtypen von Drosophila melanogaster, Drosophila funebris und Drosophila pseudoobscura.

Stubbe A. u. *M. Vogt,* 1940, Z. f. ind. Abst. u. Vererbgsl., **78**, 255-260.

II. Vergleich der Wildtypen von Drosophila melanogaster und Drosophila virilis.

Lüers H. u. *A. Stubbe,* 1940, ibid., **79**, 146-151.

III. Vergleich der Wildtypen von Drosophila melanogaster und Drosophila simulans.

Stubbe A. E., H. Lüers u. *A. Kanellis,* 1941, ibid., **79**, 188-191.

IV. Vergleich der Wildtypen von Drosophila melanogaster und Drosophila immigrans.

Lüers H. u. *A. E. Stubbe,* 1941, ibid., **79**, 396-400.

V. Vergleich der Wildtypen von Drosophila melanogaster und Drosophila azteca.

Stubbe A. E. u. *H. Lüers,* 1941, ibid., **79**, 487-492.

VI. Vergleich der Wildtypen von Drosophila melanogaster und Drosophila repleta.

Lüers H. u. *A. E. Stubbe,* 1941, ibid., **79**, 493-497.

VII. Vergleich der Wildtypen von Drosophila melanogaster und Drosophila hydei.

Stubbe A. E. u. *H. Lüers,* 1941, ibid., **79**, 498-502.

VIII. Vergleich der Wildtypen von Drosophila melanogaster und Drosophila buskii.

Stubbe A. E., 1942, ibid., **80**, 205-209.

IX. Vergleich der Wildtypen von Drosophila melanogaster und Drosophila miranda.

Kanellis A. u. *A. E. Stubbe,* 1943, ibid., **82**, 40-45 (1944).

X. Vergleich der Vildtypen von Drosophila melanogaster und Drosophila phalerata.

Stubbe A. E. u. *A. Kanellis,* 1944, ibid., **82**, 137-142.