Riassunto

Gli autori descrivono la genesi dei tumori melanotici benigni (pseudotumori) in tre ceppi vitali di *D. melanogaster,* riconoscendovi tre tappe (disintegrazione o rottura della ghiandola della linfa, differenziamento fuori della ghiandola di cellule particolari e comparsa di melanina entro masse di tali cellule). In pari tempo constatano che queste tappe sono controllate da tre sistemi complessi di fattori, distribuiti nei tre cromosomi maggiori.

Priority in Gene-Conversion

When a scientist makes a discovery he gives it a name which often implies an understanding of the phenomenon, e.g., the atomic theory implies that atoms are unsplittable ultimate particles and the name has been retained in spite of the paradox. When several simultaneous discoveries of the same phenomenon occur, confusion reigns until the problems of priority are solved. If the phenomena are operationally indistinguishable the name applied by the first discoverer, no matter how paradoxical, has precedence. The subsequent 'discoverers' get credit for confirmation and if confirmation is precise and extensive, while the original discovery was based on scanty data, confirmation may bring more credit than discovery but discovery alone confers the privilege of naming the phenomenon. Scientific etiquette requires that every worker compare any supposed first discovery with similar phenomena previously reported to prove that the supposedly new phenomenon is operationally different. Deliberate failure to observe protocol very properly lays one open to the charge of plagiarism since it may involve an attempt to appropriate scientific property by improper means. Interpretations of others must either be refuted formally (point by point) or accepted with adequate reference if one is to justify his own position as a qualified worker. To ignore the interpretation of another worker in full knowledge is either deliberate plagiarism or a studied insult.

The phenomenon of gene-conversion comprises the interaction by genes in the heterozygous state resulting in change from dominant to recessive or *vice versa.* The term was coined by Winkler[1] in 1930 to explain and describe nonreciprocal recombinations found by tetrad analyses of mosses and basidiomycetes which could not be explained by crossing-over. Recombination and crossing-over are different phenomena. Bridges[2] pointed out ... 'recombination of *linked* characters is a special use of the term (recombination) instead of its general use, which (does) not specify the method of recombination ... Whenever one uses the term crossing-over one refers now to the mechanism behind the recombination of the characters or of the genes for the characters... Crossing-over is something which occurs to the chromosomes at a particular point along their length.' Crossing-over is exchange between homologous chromosomes; recombination is the appearance of two nonallelic genes in combinations reciprocal of those present in the two original parents. Recombination is most frequently effected by the reassortment of chromosomes which generally insures random recombination of genes on different chromosomes.

Renner[3–5] beginning in 1937 and Renner and Sensenhauer[6] confirmed Winkler in a series of spectacular papers which showed that gene-conversion in the heterozygous state may occur in the soma although Winkler considered it to be more common at meiosis. Renner considered his work a confirmation of Winkler's hypothesis. Lindegren[7] proposed gene-conversion as an explanation of phenomena of recombination not explicable by crossing-over in yeast which were shown by Mundkur[8] to be independent of other possible recombinatory mechanisms. Lindegren[9–13] *et al.* published an extensive series of papers corroborating the occurrence of recombinations not explicable by crossing-over or other conventional mechanisms. Renner's papers were pointed out to Lindegren in 1956 during a discussion with R. Goldschmidt and Lindegren[14] hastened to credit Renner with previous confirmation of the phenomenon. Emerson[15], who is himself a specialist on *Oenothera,* attacked the concept of gene-conversion without quoting Renner's confirmatory work on *Oenothera.* The purpose of the present communication is to point out that a phenomenon operationally indistinguishable from Winkler's gene-conversion has recently been 'discovered' by many others, all of whom fail to quote any of Renner's papers. Each of the 'discoverers' of gene-conversion invented a new and a different name for the phenomenon.

Winge[16] described 'interallelic crossing over'. It is clear by this designation that Winge implies crossing-over between different alleles of the same gene and that an equivalent term would be intragenic crossing-over. This is, however, an unfortunate paradox since it conflicts with the definitions both of the gene and of crossing-over. Crossing-over is defined as an exchange occurring between the *loci* of different (nonallelic) genes on homologous chromosomes. This definition has the peculiar advantage of defining both genes and crossing-over. The occurrence of reciprocal recombinations of phenotypes between characteristics previously considered to be the multiple effects of a single gene comprises the event which defines the supposed multiple effects of a single gene as the different effects of two different genes. Ambiguities due to nonreciprocal recombination can only be resolved by tetrad analysis. If tetrad analysis is unavailable no definitive solution is possible. Cross-overs can only occur between genes that are nonallelic since genes are indivisible by crossing-over by definition just as the atom is indivisible in intermolecular exchange. The parallel is even more precise, for genes, like atoms, may exist in different forms; changes in their finer structure may differentiate one gene (or one atom) from another but do not change a given

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[1] H. Winkler, *Die Konversion der Gene* (Jena 1930).

[2] C. B. Bridges, Amer. Nat. *66,* 571 (1932).

[3] O. Renner, Z. indukt. Abstamm.- VererbLehre *74,* 91 (1937).

[4] O. Renner, Flora *133,* 215 (1939).

[5] O. Renner, Z. indukt. Abstamm.- VererbLehre *80,* 590 (1942).

[6] O. Renner and R. Sensenhauer, Z. indukt. Abstamm.-VererbLehre *80,* 570 (1942).

[7] C. C. Lindegren, *The Yeast Cell, Its Genetics and Cytology* (Educational Publishers, Inc., St. Louis, Mo. 1949).

[8] B. D. Mundkur, Ann. Mo. Bot. Gardens *36,* 259 (1949).

[9] C. C. Lindegren, Proc. Eighth Int. Congr. Genetics, Supplement to Hereditas 338 (1949).

[10] C. C. Lindegren and G. Lindegren, J. gen. Microbiol. *5,* 885 (1951).

[11] C. C. Lindegren, J. Genetics *51,* 625 (1953).

[12] C. C. Lindegren and G. Lindegren, Genetica *26,* 430 (1953).

[13] C. C. Lindegren, D. D. Pittman, and B. Ranganathan, Proc. Int. Genetics Symp., Japan 42 (1957).

[14] C. C. Lindegren, Cytologia *22,* 415 (1957).

[15] S. Emerson, C. R. Lab. Carlsberg, Ser. physiol. *26,* 71 (1956).

[16] O. Winge, C. R. Lab. Carlsberg, Ser. physiol. *25,* 341 (1955).

gene (or a given atom) from its specific category; the different isotopes of sulphur are all sulphur atoms and the different alleles of white are all genes at the white locus.

ROMAN[17] calls the phenomenon 'nonreciprocal recombination' with no reference to the definitive papers of LINDEGREN and his associates. BEADLE[18], writing in 1957, describing the work of M. B. MITCHELL[19], says 'Recently (20 years after RENNER) phenomena have been observed that have been interpreted as indicating intragenic crossing over. They can, however, also be interpreted in terms of a process that differs significantly from crossing over.' He originally called it 'transmutation'[18], but subsequently[20] accepted the term gene-conversion. BEADLE's explanation (miscopying) is inadequate since it fails to account for tetrads described by LINDEGREN which produce four recessive or four dominant progeny. H. K. MITCHELL[21], M. B. MITCHELL[19] and LAWRENCE and BONNER[22] are among those who have accepted WINKLER's original terminology. BRINK[23] describes a 'genic change' which occurs in the heterozygous state in maize but not in the homozygous condition. He does not give the phenomenon a name but it clear from his description that it is operationally indistinguishable from the phenomenon called gene-conversion by WINKLER, RENNER, and LINDEGREN.

A mathematical proposition may be proved by a single stroke of genius or invalidated by the demonstration of a single fallacy but no biological concept becomes acceptable on the basis of a single event or a single experiment. Repeated, consistent, and overwhelming accumulations of data are necessary to establish it. Conversely, refutation of a biological theory must consider the total mass of accumulated evidence. The attempted refutation of gene-conversion by BEADLE, WINGE, EMERSON, and ROMAN all fail to cite RENNER and MUNDKUR (WINGE treats a single paper by MUNDKUR in which MUNDKUR[24] demonstrates an error in WINGE's argument) and cite either one or two papers by LINDEGREN and his associates from a total of more than 15. Aside from the fact that this casual procedure is condescending and insulting it is arbitrary and dogmatic; in addition to being impolite it is also unscientific. Such an approach might be less unacceptable if it demonstrated a fundamental antipathy to the entire concept, e.g., the attitude of a deeply religious man toward evolution, but it becomes suspect and, hence, improper when it is used not to invalidate the theory but only a different demonstration of it.

In view of the numerous observations of genic interaction in heterozygotes and the failure of all the observers to quote the previous literature adequately, this communication will achieve its objective if it demonstrates the necessity for according proper priority to the discovery of gene-conversion and proper respect for priority rights of WINKLER and RENNER.

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Zusammenfassung

Die 1932 von WINKLER aufgestellte Hypothese der Genkonversion wurde bereits 1937 von RENNER und 1949 von LINDEGREN und MUNDKUR bestätigt. Seit 1955 haben auch eine Reihe weiterer Autoren über Befunde berichtet, welche operationsmässig nicht von dem von WINKLER beschriebenen Phänomen der Genkonversion zu unterscheiden sind, doch haben sie es ohne Ausnahme unterlassen, RENNERs übereinstimmende Befunde zu zitieren.

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[17] H. ROMAN, Ann. Génét. *1*, 11 (1958).

[18] G. W. BEADLE, Sym. *The Chemical Basis of Heredity* (Ed. by W. D. MCELROY and B. GLASS, John Hopkins Press, Baltimore 1957), p. 3.

[19] M. B. MITCHELL, Proc. nat. Acad. Sci., Wash. *41*, 215 (1955).

[20] G. W. BEADLE, Proc. Int. Genetics Symp., Japan 1 (1957).

[21] H. K. MITCHELL, Sym. *The Chemical Basis of Heredity* (Ed. by W. D. MCELROY and B. GLASS, John Hopkins Press, Baltimore 1957), p. 94.

[22] P. ST. LAWRENCE and D. M. BONNER, Sym. *The Chemical Basis of Heredity* (Ed. by W. D. MCELROY and B. GLASS, John Hopkins Press, Baltimore 1957), p. 114.

[23] R. A. BRINK, Science *127*, 1182 (1958).

[24] B. D. MUNDKUR, Current Science *19*, 84 (1950).

Application de méthodes d'analyse biochimique à une étude taxonomique: les corégones du lac de Neuchâtel

II. Cytologie et dosage de DNA

Dans une précédente notice[1], nous avons rendu compte de quelques recherches immunologiques se rapportant à deux formes très voisines de Salmonidés appartenant au genre *Coregonus*. Nous résumons ici des travaux qui ont trait au patrimoine héréditaire de ces mêmes poissons.

Nombres chromosomiques. Les dénombrements ont été effectués sur disques germinatifs d'œufs de palées et de bondelles, au terme d'une période d'incubation de 10 à 20 degrés × jours. En dépit du grand nombre de préparations examinées (quelques centaines), il ne nous fut pas possible de découvrir des cinèses d'où soient rigoureusement exclues toutes incertitudes dans le compte des chromosomes. Nous pouvons cependant attribuer les valeurs suivantes: palée (*Coregonus fera* Jurine) $2N = 78 \pm 2$, bondelle (*Coregonus macrophthalmus* Nüsslin) $2N = 78 \pm 3$. Ces valeurs sont très proches, sinon identiques, à celles que SVÄRDSON[2] assigne aux corégones

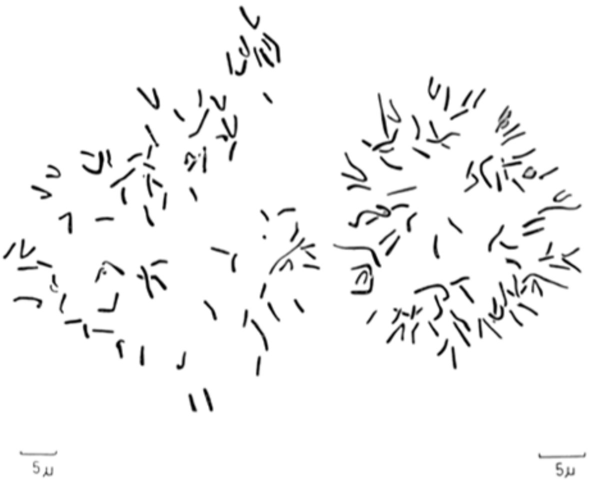

Fig. 1. A. Palée, $2N = 78 \pm 2$. B. Bondelle, $2N = 78 \pm 3$. Métaphases mitotiques d'embryons de 10 à 20° × jours. Prétraitement: 15 min eau distillée; fixation: 20 min carmin acét.; squash, recoloration par la méthode Feulgen.

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[1] J. P. BARGETZI, Exper. *14*, 187 (1958).

[2] G. SVÄRDSON, Rep. Inst. Fre-Wat. Fish. Res., Drottningholm *23*, 1 (1945).