1980/82 Rubin & Ashborner CHSL Scott 2905 Bangelone 2006 Anoton Student Seminar 20 min 26 Tadashi 2 per night 9-12:20 Lectures website for downloads 1906 - William Castle, inbreeding on feunduly 1st to domesticate to laboratory, feed banana Not life cycle, bots at eggs by 9, cheap \$ers, Not 1908 - THM pattern at preprentation "trident" on prize 1908 - THM pattern at preprentation "trident" on funticity thorax, discovered genetic variation, but difficult to study 1910 - white eye note, sex linked intendence show - Doncester had discovered sex linkage earlier in nothe abraxis (2-3 yrs) Starterant - ug Muller - grad Bridges - Gottle nasher found vermillion 1910 - 1936 foundations of state genetics - physical basis of mendelian factors not under tood - E.B. Wilson proposed mat chron carried Mend. Factors - but not inversally accepted, e.g. Bafeson - 1916 Bridges Phid thesis: chromosome prost of heredity - Briges, dupl., delepoirs, sex determination, cy to genetic maps, nomenclature, stack lists - Sturt, generfic maps (1913) - linkage Bateson & publichet in chickens 1906 - mapping was novel

<u>strut</u> - 1972) - strength of linkage varied 5-6 jenes, construct into linear map (= chomosones) - siperb at inferring chrom mechanics from genetic date - faxonony Muller - radiation (xrays , g amona rays) 1928, Nobel Prite - until 1928, prenstypic pretants, sportaneous - almost as revolutionary as cloning (Sequencing - chemical lotte Averbach England Smilitary secret M. Reppopert (?) Russia Smilitary secret -Ed. Lovis EMS - by 1936 - chron aberrations genetic basis of sex determ genets: correlates of meiosis, begin of den. genetics - Don Poulson (calteen) embryonic phonotype of - lethels, vecessive known by Bridges by 1912, earlier Bin mice and a start and - effects on emb. phonotype, hyperplasia of nerv. system. - moved to Yele, feaching prest Wrozht - Utrdorn, Zusch, lethal fictors in Development - amphasis on pr, not wild type - 1945 - 1970; Dros not strong, D.O.E. Worded, - Ed Lawis exception - very assumed chronic regioness but no purpose, intellected challenge us - change w - change by developmentalist, Lawrence, Gancia-felledo in Europe - 9 US. Madrid, Cambridge, Luich - 1966 1st <u>molecular</u> Rifrosso & Spegelman - vosy Henschel Mitchell - Xdh ? pre-molecular remillion trp poxidase ? links shown genes & proteing

- Ritossa & Spegetman - bobbed sex linked nost proximal to componente, many alleles, variable, revent to mildtype stor. J. -shoned 18\$285 RNA > 6066ed - Hoyness, Stanford pa1980 -TES Rubin / Finnegan - hybrititation groundkin - histores - Ubx Bender positional clouing - chrom walking a - 1978 1st seg hsps histories I post doc lifetime per gene cloned.
DNA sequencing, MG very dengenous, hydrorne, rocket, fred
late 1980s -, John Sulston, physical map; C. elegans - Bob watters for - physical maps, sequencing Ath 1999 - 2000 WGS stanted Apr 1999 annowseed 1928 Sep 1999 1st assembly ) Tousquesis, poursponding in bacteria nois effective tool yeart - Fink, Cornell Begg (?) folintfyingh 1982, spoding & fubin, l-element fansposition - hybrid dysgenesis, sterility not complete, fertile flies 1 Sturrs CT annorned before published in 1983 - distributed stains to plasmids - Golic, exogenous recombinases - success of thes: - utility as experimental organism · small chrom # known by Nettie Stevens 1907 (nietzphase kanjotype) · Polytence drom. 1936 Theophilus Printer -map rearrangements / deletions / Lupliations (Bridges)

- Lundsay polytene napping = physical map - polytene mapping in site perfected by Pardre resource sharing comfer examples Datura, Blakesler yeast. - Witherete = life history - synan thropic - cosmo politza jexcept extreme alltide / laphode - generalist - origin st D- mel not a question with mid - 1950s - early showing all N. American, current lad shains also N.am, collected in 19201 - Meigen 1830s described man erropen P. mel - N. Am D. mel not native - lavgeography & molecular variation - D. S.m. bus, Sturt, 1919 - D. yokuba, Burla, 195.4 - 1970s Tsacas, David, collecting in Africa 6 more species parties and the - west of rift Om >> Ds. - yak savanaly - teis froqual free - erecta only in w. Africa, only breed on pandams - orena only found -1. the is Cameran. 1sk of helerochrometion -sec only some islands in scychelles, mirinda octoroic acid, [same concentation mel will die] man only murities san only sampmen, volcanic island, yakuba at lootton - closest to mel subgroup are in India/S.E. asia

1. Hit. of Dros Genet 2. Life history & biggeography No. 3. taxonomy Date t Classification - no good foss. axonom entymology, phylogenetic analys ennig . nonophyletic groups paraphyly mophyly Ned characters vS pleisionorphy Kos workhy Thropols resp syst. which dorsa legs 210 Fr Unss. 6 ,'4 simila Insecta lepitop temiptor hemine tabolous homenetolous رمعام siphonoplan (fleas) diptera hind wings reduced to halteres 25 K species - mosquite tocera elunio ivnar clocks it to the head capsula brachycava Lyrhend coupsile -> proteiorax = aschita - schizophora - cyclorapha tans which a ciq)yp erate wing lobe caly >70 families a caly pterste 4 associate u/ ingle plants arsified /w ) 15 ale cretacious 100-65 mga in : n italia NUCE\_ associated or their degs higher plants J Inosophilidae ø ~ 4000 species - conter of diservit SE ĩs asia

life hist. Cat microorganisms

No.

Date	•	•

- wing veration bristles & arista /ant dehne e.g. Aniota ander fissils from eosene · Steganine - no actio Adh Jub famits · Drosophinae ethanol - larva adapted to high - regetable - based for memberhon - by yeart / bacteria - e.g. repleta group (hyden exception associated yeachers, 0.9 - eg D. puchya (bill Head) - insects synthesize steroids, but needed for cannot chbresters permitted by active Adh, single Q. dre dersophile Adhis gane - Adh - 4% eth will kill o taprinus · chymomy Za (agression yeast 2 Adhis · Drosophila (paraphyletic) Steve Benver formentative receptonships poor h 40 genera Non realist Idionya (1-2K spa Idionya (1-2K spa Idionya Duriny big island I my a - underne Spa - Saturd island - SHITEVAN st Droso philanee taxono, interrupted fighte abor Pressphi 4 spirades 0 Subgenus I lengites cont. 2 spirales black Sophophon lanogaster -110 species scora to loarchic Species groups observa · willistoni s-bhopical · saltans 9 Sp o nelanogaster species 2 year poge 2 SEGAN biggst montion Africa annannsee

- SE asia -> Africa ~ 20 mga pro- Af \$ 1/10 seperated by Jethys ("now med \$ Red sea) \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_ (<sup>\*</sup>\_\_\_\_\_\_ \_\_\_\_\_ \_\_\_\_ 

Genefic Analysis - eye pignent cells contain brown pignents - onnochromes - from tryptophen ved " - pteridines - from granne - while gene is transporter for precursors of pignents - vermillion, defect in brown pignents brown, defect in ret pignents - Margan should we was sex linked  $\pm / + \times \omega / Y P$  $\omega/+ \times + /\gamma = F_1$  $\frac{\psi}{\psi} + \frac{\psi}{\psi} + \frac{\psi}$ shows that wis sex-linked and not just sex-limited € ~ (~ ~/+ 8 w/4 +/4 - recessive - lower case | superscripts for alleles dominant - uppercase | semicolon for diff chron - Bafeson, early British geneticists, "presence absence" hypothesis - apricot, intermediate phenotype, behaved as allele off 102- W'/wax +/Y - allelie, segregate - multiple alleles dopored / - only see white or apricol of  $w'/\gamma w'/\gamma$ - verer see all 4 classes predicted by 2 locus system ! May The (91) 1 abbreviated to w<sup>29</sup>e - infoduced by Bindyes - avoids numerical series classies in w 1 1 ° 29 day north year disdiluted network

"the se of m - pris- to 1928, all per spontaneous - low frequency 1/million - Ed Lewis - Red Book ~ 1965 - Itw/Y's Itw is allele of scute su(1+w)/su(1+w) Su(1+w) hound by Bridges example of supression, interaction I found that su(the) could suppress phenotypes of nonny nutations, all <u>spontaneous</u> no x-ray/chemical, not all <u>spont</u>. majority of Jutare transposable element A collecte all n 3 assess 26 by TE A collecte all n 3 assess 26 by TE A collecte all n 3 assess 26 by TE D- stable p, vory, very are reventents Boundestinction w/w q x wt/y w/4 w+/w expected matroclinous white 9 J-1/2000 exceptional mildtype o? patrodinous projèny - exceptional progeny at rate < spont ~ \$ occurs very regularly - noin-disjunction, Bridges, fuilure et meiosis I - it failure et meiosis I, egg has 2 X - crosses predict XXY & \$ X0 of - vondisjunction on 2 \$ 3-d leads to lethality, 4th can be observed implications for neiosis (not perfect, error rate higher them prate) & sex determination Set 1 - Y not male determining - X: A rafis, balance hypothesis, 1925 Bridges

- Bridges hypotresis was undely accepted even for homens your - 1950s tages showed y determining - no sex hormones in the first of - no sex hormones in Dros / insects ( - butterflives, male & female in same org - J- gynandro morphs, Morgan, rave - sophophora, sexually dimorphic of langer than or 6' see comp of pignented on abd. - gynandromosphs are normally 57:50 down midline +25kon - not possible w/circ. sex hormones - cause is nonaisjunction in mitosis or chron loss in nutosis mosaics Sturt, sed gymandsomptic for file mapping in D. sm to study development. for for mapping - 10 nuclear divisions - pole cells - cellularitation - map fate of blasp derm to adult structures - (968 Sturt, Ash & Garc. Bellido & John Menniem 1970 J. exp. 700/ -chron loss only occurs very early in des - wa/y & wa/wa show some phenotype we/y lighter topan we/we 1932 1932 Muller we dosage effect - Cutt Stern Statige studied desage compensation - Gosage comp established after sex determination - if choon loss after dosage comp /sex denter then lether to cell lineage

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~ found chine where all recomb were double Xover but no single x-overs Ving-vod het can only have & double X-overs - worked out by genetics then test u/ up to log g - "unspuble rings" generate gynandromo-phis at hogh rate, hand to keep stocks, molecular/genetic basis of instability unknown - tandem mekcembrie at metrobate makes a spiral Y OY O can be used to generate ving chronosones - exchange locks choron together, ideal if homologs X-over, not 6two sisters - can use ring to see if sister x over accurs (oss - only inner most shromatid - smehic ongeneering chows gene order - X-overs 1St seer cytologically - Duteson & Prinnet -> linkage - Strit (?) Shoved genetic X-over T -1932 Muller 6th congress genetics (see also J - nomenclature of clueles wa/wa = wa/Y dosage compensation wa/Df(w) < wa/wa palar u/ 1 copy wa/wa; pp(wa) > wa/wa darker than q - Ofs can occur in het, but only N ~ Mb

- Df 1st made by Bridges (after X-rays?) - many varys to Dp free duplication Dp (1:f) - manuf - could do same dosage expt w/original w' no change in phenotype. - classes of putation W amorph loss of fren / null l'never study messy mutation always know nature st - assay for allelic type (~90% reliable) M/M vs M/Df(M)= null < hypomorph - cant just sequence / western, Dros is good at reading them will nostly hypermorph gan of fan alleles dominant, not - antimorph gan of fan alleles rare - neomorph Swierted by deleton (Sco) rare - neomorph Soprosed at product (prew fan, temponel, spekal (eg Antp) hypermoiph Dp (m) > m/m > m/- insensitive to dose ran reverted by deleton. mostly chromit alles hows can be

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Minutes (brother small, not body) - Dominant M/+ - recessive lethal m/n plead - small bristles. - develop delaged - large # of genes - haploinsufficient (coined by Lindslay) - great najor by of haploins. The ignt are minute - +/Df => minute ? remainder affect Hightlasson - proteins required in strictionetric, not catalytic concentrations - 1st typo thesis that minutes were tRNAS, general family of course - ~60 minute toci - 88 cytoplysmic ribosonal proteins genes, 29 proteins 75 mt RP - 64/65 minute - CRP, not to mt CRP - 2 lows haple & triple lether Tpl - 2 minute loui, "additive most severe Jack Schultz - not all dominant pe are haploinsuff. temp, - my - struggle to find/effects on pr because looking for visible - easier to find lethals, Muller  $l/+ \rightarrow l/+$ wf. l l/+ +/+ - but hand to keep lethed in stack - Muller proght to have 2 closely linked lethely  $\frac{l_1 + l_2}{l_1 + l_2} \times \frac{l_1 + l_1}{l_1 + l_2}$ - balancing, belanced lethals no meiotic genetic recomb in 6 ando have of recomb

nu tagene siz - use 5°, why? - more or gametes - Spern metaloolically inert - oocyte lange cell - finding notations  $\chi_n/\chi_n \odot \chi_1/\gamma_1$ single Xp\*/Xm × Xn/Y L Xp\*/Y deal if X-Inted recessive (etal Xm / Y 18:29  $\frac{\chi_m}{\chi_p} > 2$  $\chi_m/\chi_p$ - Bar small samples (no sig det on, g) lose metation shurt 1925.  $ClB/+ \times X_p/Y$ Xp / CLB @ X/Y  $G \sim 1$ straken to show pret & M X-rays & M if lethel no males ratiation implications non-quants Jehne as say CIBY dead

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- Attached X in & Anderson - y c. m f C(I) RM y+ cv+ ~+ ++ Ter m + ft mt cr y. - phen m.t. q produces recomb daughter 10°6 y ev y ev m y ev m y ev m f 10% 10% 2% 1st mei larison honologs 2nd mei dir. sisters (like mon y com f - tells us that X-over occurs at 4-stand stage - can involve any non-sister chromatids - a thehed x allows 2 chromotide to be assayed - at least 2 errors in Bridges paper, pointion of centromero norg (at the) - compound chrow also allowed centro more to be napped - von compounds single exchange on X ground 60% - double x over 30°/0

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Performance in the second s second s second se

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\$ 2 outer normal - SCO causes dientric - 2 shand double  $\int \odot$ . .- ()----I leads to eggs w/no X chron - Fig ILL, p 107 of foberts - predict 3:2 ratio of PCO: patriclinous malary - Sandler said twis now "proce science" - Isabel Thromas noticed 3:2 DCO: NCO - para contric soppress exchange by soppression of recovery - medium size inversion -In(1)d1-4940°/00FX is het. no cross overs in het. - SCO u/in inversion cause dicentric can't recover - suppression of Xover near breakpoints is not due to elimination - Ed Novitation (advisor to Ptashne) & Braner 1954 2nd hurdest to read 1st is Framer made reverse metaeanhic with inversion - found suppression on both sides of breakpoint

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- FISH shows exchange doesn't suppress priming - fer mrennen in yeast, be exchange M~320 per maisis, cp 5-6 for flies - Italdane's Rule, exchange scaled to have zi exchange for door. Listinghon - Brdges 1916  $w/w \neq +/y$ primary Juchon w/w/y x +/y 1/2000 nondisjunchon wor where regular progeny Lecondong ton w 9 wt or exceptured progeny 5-8% nondisjunction - both types of non-disjuction occur at meiosis I - XX <>> Y, not undergone exchange - Bridges angled that <</p> - max freq of 2° non-dispection is 50% 27 - Sturt & Beadle found excess of 50% - Cooper miranda, X, X, Y - if X - Ma NCO (don't X-over) - <u>x</u> ex trivelent - predicts the 2°ND & NCO, con see 1 80% 2°ND - Y with 1 arm has SD°60 2°ND - Youbin XYX in merohr prophase No K X-overt X's Crossover 2 0y cen pair at randon in yeart, after x-oren honologs pair

- welcom - job advent - RST/RS3



Sm3 Fm7

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- types of meiotic nutants exchange defecture veg to make DSB 68,22, tren v not maining mussil procondition 28,332,219,352, ment, rec replication , - ig . proteins mutants Segregation sig. defective - can't find meiosis genes first are also involved in milosis - genes in meiosis put are dispensable for viability & ferhilv - Now to get by pass requirement in inbulity? - T.S. M mosaric analysis - prove to 1977 nobody tried to visualize moissis - Notkala ? Puro, orecin ory to etect A thread DSB affer promon no centride no centorones no asters - big question, how does I coundle form - text book meiosis is - 4th has DNA tinkage Shrough threads - O' no synaphonemal complex, no DSB no. recomb X - Y pairing the rDNA array collo chore

A higher rel ste of indels on actosomes no DSO in or so less RSB indused indels. - Kanpen X del 65°, fransgene of -DNA - intragenic spaces - nucleolus cohesion remainder - part XY rDNA - chron 2 historie parting gener 3 ?? 4 collochere sife 9 Y N N ST N Y N Hunley 1992 - het priving in 41th derivaties Kapen 1996 - het (FOKb) pairing sufficient Demberg 1996 - gtological evidence - rocomb in \$ on 4th at 29°C or triplivid Screens - TS pr in nervous system Darrel Felk - paralyson - paralyson - paralyson - paralyson - paralyson - screen Us. Selection - screen Us. Selection only get pr of interest filter manually selection not none specific may miss neak

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suppression only user in cis erld + w.t. - if RNAi then novid nork in tans I shall she - 7 sippressors / 1500 lines, BR - HiszAV Bideoxy Alsoresian dyes antomatic seg - a capillary - not hits in deft per - some gene - good het - get I hit, reseg ofner r in that gene (not whole genere) - insertional alleles (P) are usually neak hyporuph - excise imprecisely - general rule, want > 1 hypomo-phic allele - always find complete loss of four before genetic analysis of complex paits - jugenesis done in narked je background dant jugenited w.t. chron - gratitous neurbers - smap backgrud chrom - be extremely careful abt leadeground pr - if A prote many be polymo-phic prin original stock -vake chrom isogenic before progenis pr/pr x C-p/S=0 singled pr/cyo × Go/Sco7 pr/G0 # 7 Vor/pr pr/ Cey @ or

- isogenic: neu p & records -/ belancen - can save a lot of work down stroam - freeze down som isogenized this po sequence after EMS - FSBE inbreding, 4 chrom 17 gen for 95% isogenic, lethals, inversons - EMS alkylates ty = c GTK GTC - voplication leads to mosacism could be a geralin - can conforred screens to letals - solve by making a isogenic - replicating instability Averbach, nature interious - screens for chion abbrations - can use pseudo - linkage for Trustoaton screen - can use pseum recomb suppression for Er D - M of choice is X-rays suppression of winter for dup - X-vay induced breaffoints are messy - ouch durision is Atta 1-1:2 Mb 120mb/100 leftered subdurision 150-200 Kb - delepion of <4 division and survive (~1Mb) - delepion tit & D°10 of genome, why met 1000% haploinsythis epit, seg limits unknown - FRT based deletities, seg level vesolution clean breakpoints - Bidges, diff elleles of when complement bx'/bx'te - Lewis construction at the alleles of the frensvector - Lewis complementation of ubx allebes depended on paring in somehr (ell, - somatic pairing my states interphase & metaphage - mitotic , crossing over Stern 1936 Genetics Y/+ yellow prtches on wife background

- gynandro norphs - fate mapping = mitobre & open - flp - frt ( lonal analysis sex dimo phil region - can't be X-loss, if in post tergites predict blackaned particles, not phan. on y si yy , ++) somatic (mitotic) x-over, can also occur, r pre-merofix x-over (not just soma) - 4 Inicions in or gentine. - Hous becker X rays T mitotic X-over - cloral analysis - replaced FRT stocks, FIP-FRT - milite x-aver of = Bi valilier meister - RNA system required for mitotic but not meiotic parting bx'/bx 34e wt. P= Tiquersion or R (bx') / bx 34 e Transbachen hyp: that rearrangement heakened comparing & producted that the pansvection dep in sometri lairing Reveed to be near Uhr 89B, not just - Madeleine Gans Zeste Z/Z yellow eyes  $\frac{\omega}{\omega^{+}} \frac{1}{2} \omega t.$ - y, many diff, alleles, some trend but diff phenotypic variation pairs of y alleles w.t.

- eya, y, w, bx, dpp show francrection - intragenic complementation pairing dependent. - allelic exclusion in immune cells & olfactory cells Pelement & pranseenie analysis - hybrid dysgenesis, aliste. - hybrid dysgenesis, white - P-element, structure, TR & TP - exogenous DNA disrupts P- tp - use helper TP, but helper can also integrate - vosy, ry drosoption brospith defective. XdA - only fem?lo Xdh = w.t. - rosy not cell autonomous, diffusable allow fun (ells = w.t. - Rah laving helper when TR autocs clipped" - Bob Levis helper w/no IR, angs clipped" - good hands fen ?o transformation - reavly all lub strains don't have p-elements - marker, early ryt, wt, mini alute - size 1 ethicoency L - hobo, minos, marine, hernes, pijsybac - loopanota hydei nav. mus f- hi not host? - allows reversion assay, precise excision bacality - 223:996 ,Sb perole The rembelization oute rais ?? doerthis depend on 1. - local hopping VI - homing. - position effects - P into heterochromation silenced to insert - insulators to beffer per pos. effects (Supor P) + Fisher, Brand GAL4 - JAS ench trapping lact / CAT4 const - combine entitrap w/ GAL4 construct

-t chronce of promoter for galf, hep Aztst da elan ub. - Inducible cell killing, Ricin A Diptheria A - FLP FRT FRIs are identical - AC31 2 L atto & attp diffe att 1-integrase atts backenta -03-ED-2 hybrid siles makes re vogute by bird sites - QC31 can go in in both orientations, but same place select sume onentition - 30°/0 of will -> lethal - und & = out easier, KO, previse -ends-1 = EP lives \_\_\_\_\_ -----per de la constance de la const

OLI+ KMAX) K= # diff blun two seg is yoursample  $2\mu(1+0)$ - vanging mutation rate, more aboute menn - timbuliabue, skered toward rare = wropen, foo fer ares - n = 1. 403 × 10-2, 10 ger per year 2.3×106 Ne 11.5×106 · bok year ago C26-95 k) transition during inter-ice age period savannas prevailed desing glacial maximum Expansion before tast glacial maximum, fousition to homestication. 44k (12-15K) 16K Ne=1.4×106 Some as Bottleneek Af fonder 2.9×103 [700-14,000] Auration 340 (20-(000) will be to prote mutation freq spectrum dile larging's rolation will be tendency for sweeps in proximal half of x - 1/3 of mindows Europe ) condudates for adaption - 1/4 of rindom Africa - 2 sverlapping

- very fen pr v/ S > 1% - Europe has shift famads higher S, beranse can't observe for s in for pop site 0.061×104" bial on defecting dist of S as for af Ne 0.061×104" ISD adaptive pr on X during 60K years, Af 0.088410" S8 /1 n 16 K for ver site per yer -X/A $N_{\rm X}/N_{\rm A} = ..51 - 1.125$ - six ato × (\_\_\_\_\_ A units of N generations - X has higher she of adapthin - 3.5 my - modern 400 cc 1,400 cc

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Char-T. Ting Genefics of Speciation - F1 - Haldane 1922 - geneties of reproductive isolation - biol species concept, limitations : fossils, asexual - pre/post zggotic rolation -how many genes / nucleohdes responsible for species differences - classical, molecular, population genetics of speciation - Haldanes (1922) rule, beforgametic sex, original observation true in many taka - causes of Haldones Rule, why effect of sox cham - dominance theory - fast - male theory - fast & theory - meiofic drive - D-M model relefed to dominance theory ? HR easily explained on X if incompatibility is X-linked (\* therefore "dominant" is of) - F1 8 is always "unbalanced" is belanced ¥ - con ve make inbalanced of? settached -x - 1985 Terry (syne 1st fest using attached - x sterility, ubalanced & 11 tentile I Dominance theory cannot explain HR - Orr 1993 same test for inviability also (Shurt / Ashburner) imbalanced & inviable - introgression, how many trafors involued in skenlify - multiple loui n/epistotic interactions (sin - may, sim-sec) - sanamura introgression in rescue background - True &- element Marker introgression - Presquares more incompribility genes of X

- many genes - sterility in make is not common phenotype - all regions act recessively -large X - effect caused by higher density of hyberd in compatibility on X · veck effect, strong interactions V Dodthansky - meiotic drive - animals often have x-linked drive systems sex apis not 1:1 87 51 97 XX × X°Y all gf strong dure sex ratio suppresso- on y could de elsentre XX XDY, shong selection SD°/0: 50°/0 - recomb inbred lines, Dermitratis (differs for (uprogression, just backcross) > F1, F2, then sil making Tao Inver on X (dox) inverted repeat not much young (umy) retrotransposition mother of dox, ancested (ocus Tao

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HMR J Alph Lhr Nyp 96 OdsH - mel g x sim or no males look for male ressure use natural strains - Hur, X-linked, tet debriency nopping, Jans for mation HMr 2 is P-element inserton - Zim & × balancer or Chinq-I stid cross, I week lefe no maggots - 60 pairs Z, 60 pairs M - 2 female Choose Z males - prezygotic, ~20 genes Z-M - dsat 2 loss of fran in M strains 2 is wild type - 7 males interfere w/each ofther to get makes 72 2 an 2M competition - male-male competition in African pop fut not in Europe

Ting Semihar - innigrans - sin clube - sin clude, & F1 fertile - r-pid evolution (except for transposition (orr)