

# Yeast Cell Biology

## Session 1 CHROMOSOMES AND KINETOCHORES

WEDNESDAY 8/15/2007, 7:30 PM

R. Rothstein

#	<u>Iname</u>	<u>Title</u>	<u>Talk Length</u>
1	Rothstein	A screen for disruptions that alter spontaneous Rad52 focus formation and kinetics	12
2	Haley	Gal4-dependent reverse recruitment of Gal genes to the nuclear periphery precedes activation by perinuclear RNA polymerase II complexes	12
3	Ahmed	Understanding the mechanism of dynamic gene recruitment to the nuclear periphery	12
4	Aragon	Cdc14 down regulates RNA polymerase I transcription in anaphase to allow segregation of ribosomal repeats	12
5	Irvine	Argonaut slicing is required for heterochromatic silencing and spreading	12
6	van Leeuwen	Kinetic mechanism and function of mono-, di-, and trimethylation of histone H3-Lys79 by Dot1	12
7	Bachant	DNA topoisomerase II is a determinant of the tensile properties of yeast CEN chromatin	12
8	Bansal	Sgt1 dimerization mediated by casein kinase II regulates kinetochore assembly in a cell cycle-dependent manner	12
9	Knockleby	Aurora B/INCENP mediated sensing and repair of defective kinetochore-MT attachments requires Ame1	12
10	Jwa	Regulation of Sli15/INCENP complex, kinetochore and Cdc14 protein phosphatase functions by the ribosome biogenesis protein Utp7	12

## Session 2 CELL CYCLE AND DIVISION

THURSDAY 8/16/2007, 9:00 AM

M. Segal

#	<u>Iname</u>	<u>Title</u>	<u>Talk Length</u>
11	Huang	Two Cdks, Cdc28 and Pho85, regulate the G1 transcription repressor Whi5 through controlling recruitment of histone deacetylases	12
12	Futcher	The yeast G1 cyclin Cln3 binds the <i>CLN2</i> promoter, and regulates it via histone deacetylase	12
13	Benanti	Regulation of the glycolytic-gluconeogenic switch by the SCF <sup>Grr1</sup> ubiquitin ligase	12
14	San-Segundo	Role of the <i>S. cerevisiae</i> Ddc2 protein in the meiotic recombination checkpoint	12
15	Elkin	Regulated degradation of Spo13 at the metaphase I/Anaphase I transition	12
16	Goto	Initiation of anaphase inactivation of the spindle checkpoint	12
17	Hall	Pseudosubstrate inhibition of the anaphase-promoting complex by Acn1	12
18	Chiroli	Budding yeast protein phosphatase PP2A <sup>Cdc55</sup> prevents anaphase onset in response to morphogenetic defects	12

19	Oliferenko	The spindle pole bodies facilitate nuclear envelope division during closed mitosis in fission yeast	12
20	Maekawa	The molecular function of Kin4 kinase in budding yeast	12
21	Chen	The SIN kinase Sid2 regulates cytoplasmic retention of the Cdc14-like phosphatase Clp1 in <i>S. pombe</i>	12

**Session 3 POSTER SESSION I**

THURSDAY 8/16/2007, 2:00 PM

<u>#</u>	<u>Iname</u>	<u>Title</u>	<u>Talk Length</u>
22	Amberg	Physiological roles for actin redox control	
23	Gao	Yeast is viable in the absence of localized formins	
24	Gheorghie	Crosstalk between actin and microtubules in an in vitro reconstituted system for <i>S. pombe</i> cytoskeletal dynamics	
25	Lee	Interactions between dynein pathway components and Num1 in budding yeast	
26	Lopes	Interplay between Bud6 and formins in control of spindle polarity and orientation	
29	Choi	Regulation of the Pcs1-Mde4 monopolin complex by the Cdc14-like phosphatase Clp1 in fission yeast	
30	Chou	Development of thiol-reactive inhibitors for Cdc48/p97 AAA ATPase	
31	Futcher	Induction of DNA repair genes—Cell cycle specificity, and replication outside of S-phase	
32	Keck	Regulation of the function of Nap1 family members	
33	Manukyan	Ccr4 modulates cell size via changes in the timing of <i>CLN1</i> and <i>CLN2</i> expression	
34	Martinez	Identification and regulation of Acm1, a novel inhibitor of the yeast anaphase-promoting complex	
35	Ramachandran	Quantitative imaging of Cdc14 release from nucleolus in <i>S. cerevisiae</i>	
36	Szkotnicki	Elm1p activates Hsl1p to degrade Swe1p	
37	Chan	Epigenetic regulation of cell wall genes in yeast	
38	Choder	Transcription and mRNA decay are coupled mechanisms	
39	Cuthbertson	Discovery of an mRNA target for zfs1, the single TTP family member expressed in <i>S. pombe</i>	
40	Kuchler	The yeast transcription factor War1 undergoes stress-induced conformational changes on the <i>PDR12</i> promoter to elicit weak organic acid stress adaptation	
41	Kucej	Structural and compositional remodeling of mitochondrial nucleoids in response to metabolic cues	
42	McQueen	A new kinase involved in the DNA replication checkpoint	
43	Moore	Regulation of the Sum1 transcriptional repressor by Ime2 during meiosis	
44	Nallaseth	Complex formation between holiday junction (HJ) recombinatorial intermediate structures and the yeast orthologs of Bloom's syndrome helicase/topoisomerase	

45	Koepp	A novel role for the RNA export factor Yra1 in DNA replication
46	Tang	Roles of yeast peroxiredoxins in cellular defense against DNA damage
47	Barbara	Lesions in the Nup84 subcomplex impair glucose repression by releasing Mig1 repressor from the perinuclear compartment
48	Baumler	Synthetic genetic analysis of <i>mps3</i>
49	Bupp	The SUN protein Mps3 is important for silencing and telomere positioning in budding yeast
50	Cajigas	H2A.Z-mediated localization at the nuclear periphery confers epigenetic memory of previous transcription
51	Horigome	Novel roles of ribosome biogenesis factors in the nuclear membrane
52	Dawson	The RSC complex plays an essential role in yeast NPC assembly
53	Titorenko	The life cycle of the peroxisome
54	Eves	Evidence for direct binding between Myo2p and the vacuole-specific adaptor protein, Vac17p
55	Caudy	Large-scale validation of computationally predicted mitochondrial biogenesis genes
56	Saraya	Peroxisome proliferation in <i>H. polymorpha</i> is dependent on organelle fission and requires Dnm1p and Pex11p
57	Rafelski	Mitochondrial morphology—Quantifying tubular networks in 3 dimensions
59	Bourens	Analysis of the role of the protein kinase CBK1 in polarity and mating—Characterization of extragenic suppressors and transcript profiling of partial loss of function mutants
60	Measday	Activation of the <i>S. cerevisiae</i> mating pathway by deletion of Sst2 causes cell type specific sensitivity to kinetochore and microtubule defects
61	Haerizadeh	Genetically encoded FRET based nanosensors to systematically characterize signaling networks controlling glucose flux in yeast ( <i>S. cerevisiae</i> )
62	Maeder	Spatial regulation of Fus3 activity in yeast pheromone signaling
63	Mehta	Characterizing an evolving family of calcineurin regulators
64	Romelfanger	Signaling specificity in the filamentous growth pathway in <i>S. cerevisiae</i>
65	Rudolf	A mechanism for Ste11 degradation upon activation of the pheromone response pathway
66	Shah	Docking and scaffolding contribute differently to promoting signal transmission in two overlapping yeast MAPK pathways
67	Tanigawa	Temporal segregation of sensor machinery ensures specificity of stress-responsive MAPK activation
68	Bosch Ibáñez	AMPKIN—Systems biology of the AMP-activated protein kinase
69	Carman	Acetate homeostasis and weak acid stress in yeast
70	Erjavec	Sir2p-dependent damage segregation in a symmetrically dividing system and its implications for fitness and aging
71	Titorenko	Molecular systems biology of aging—Using yeast as a model system for defining a modular network controlling chronological aging

72	Gulshan	Positive regulation of the pleiotropic drug resistance pathway by the bifunctional mitochondrial enzyme Psd1p
73	Krysan	A role for the yapsins, a family of GPI-linked aspartyl proteases, in the release of extracellular proteins in <i>S. cerevisiae</i>
74	Li	Complex haploinsufficiency interactions with the vacuolar H <sup>+</sup> ATPase genes
75	Lu	Stress response genes important to survival during heat shock are induced during slow steady-state growth
76	Daignan-Fornier	Individual fate of yeast cells facing chronological aging
77	Yang	Role of MCD1 in triggering yeast apoptosis via its cleavage and translocation into mitochondria
78	Aliverdieva	Yeast <i>S. cerevisiae</i> dicarboxylate transporter—Inhibitory analysis by means of lipophilic derivatives of its substrates
79	Kucejova	The evolutionary conserved CA <sup>2+</sup> -dependent mitochondrial carrier Sal1p affects mitochondrial protein synthesis and mtDNA maintenance
80	Maresova	Regulation of yeast cation homeostasis by potassium transporters
81	Pribylova	<i>Z. rouxii</i> possesses two Na <sup>+</sup> /H <sup>+</sup> antiporters with different substrate specificity
82	Protchenko	Plasma membrane protein Pug1 is involved in porphyrin and metalloporphyrin flux in <i>S. cerevisiae</i>
83	Stowers	Extending synchrony and deconvolving population effects in budding yeast through an analysis of volume growth with a structured Leslie model
84	Friesen	Synthetic genetic interactions between genes encoding protein kinases
85	Kao	Tracking population dynamics during yeast evolution in vitro
86	Sherlock	<i>Saccharomyces</i> yeasts as a model for finding Dobzhansky-Muller determinants of speciation
87	Lee	Annotating low abundant and transient RNAs in yeast
88	Logan	Analysis of the Glc7/PP1 phosphatase genetic network using a novel catalytic mutant
89	Magtanong	Using a barcoded ORF library to identify essential gene dosage suppressors in <i>S. cerevisiae</i>
90	Qi	Familiarity breeds contempt in gene networks
91	van Dyk	Exploration of the non-essential yeast kinome by systematic synthetic dosage lethality (SDL) screening
92	van Wageningen	Expression-profile phenotypes to uncover regulatory pathways
93	Vizeacoumar	Phenogenomics of yeast mutants coupling synthetic genetic array and high content screening system
94	Ye	Predicting temperature-sensitive ESA1 mutants through integrating structure and sequence information

**Session 4 TRAFFICKING**

THURSDAY 8/16/2007, 7:30 PM

B. Wendland

<u>#</u>	<u>Iname</u>	<u>Title</u>	<u>Talk Length</u>
95	Baird	Phosphoinositide 4-phosphate signaling at the plasma membrane—Identification of a novel regulator of the PI 4-kinase Stt4	12
96	Jin	Proteins that regulate PI3,5P2 synthesis and turnover reside within a large protein complex	12
97	Cuif	Interdependence of the Ypt/RabGAP Gyp5p and Gyl1p for recruitment to the sites of polarized growth	12
98	Santiago Tirado	Phosphatidylinositol 4-phosphate (PI-4P) is important for the secretory functions of yeast myosin V, Myo2p	12
99	Hou	Exploring the redundancy of DHHC acyltransferases in yeast	12
100	Lupashin	The conserved oligomeric Golgi complex directly interacts with the T-snare Sed5p/Syntaxin5a enhancing stability of the intra-Golgi SNARE complex	12
101	Williams	Genetic interaction between the V-ATPase and exocytic snares	12
102	Wendland	Clathrin adaptors regulate progression of endocytosis by interacting with endocytic scaffolds	12
103	Teis	MVB sorting—The assembly of ESCRT-III at the endosome	12
104	Ellis	Polarization of plasma membrane lipids in fission yeast requires a discrete endocytic recycling pathway	12

**Session 5 CYTOSKELETON**

FRIDAY 8/17/2007, 9:00 AM

J. Vogel

<u>#</u>	<u>Iname</u>	<u>Title</u>	<u>Talk Length</u>
105	Cuschieri	Tub4 facilitates interactions between Bim1 and Cdc28/Clb4 at the SPB during early spindle placement	12
106	Miller	Bik1p, a plus-end microtubule binding protein, interacts with the machinery for SUMOylation	12
107	Moore	Function of the dynactin complex in yeast—Evidence that dynactin mediates offloading of dynein from the plus end of the microtubule	12
108	Gestaut	Rings are not required for processive microtubule driven movement of the Dam1 complex	12
109	Khmelinskii	Cdc14 phosphatase controls anaphase spindle extension through dephosphorylation of the spindle midzone organizer Ase1	12
110	Longtine	Filament assembly is required for septin collar formation	12
111	Nishihama	Mechanisms of cleavage furrow ingression during yeast cytokinesis	12
112	Lord	Regulation of fission yeast myosin-II during cytokinesis	12
113	Ge	Pxl1p, a paxillin-like protein, stabilizes actomyosin ring and promotes cell separation during cytokinesis in fission yeast	12
114	Rancati	Adaptive evolution of cytokinesis mechanism in budding yeast	12

**Session 6 POSTER SESSION II**

FRIDAY 8/17/2007, 2:00 PM

<u>#</u>	<u>Iname</u>	<u>Title</u>	<u>Talk Length</u>
116	Crisp	Chromosome transmission defect---A consequence of imbalanced expression and mislocalization of histone H3 and its variant, Cse4p	
117	Skibbens	Roles of the Cak1 and Cdc28/cyclin-dependent kinase in sister chromatid cohesion	
118	Vas	A role for the replication cyclins, Clb5 and Clb6 in sister chromatid cohesin	
119	Huang	Faithful segregation of the multicopy yeast plasmid through cohesin mediated recognition of sisters	
120	Chan	Scd5 regulates the functions of the Ipl1/Aurora-B protein kinase complex and protein phosphatase 1	
121	Keating	Phospho-regulation of the kinetochore protein Dam1p	
122	Schmidt	Genomic analysis of cohesin dynamics in fission yeast	
123	Wallace	The kinetochore protein Mif2 is targeted by Cdk1	
124	Williamson	Involvement of Bir1 with histone deacetylation and centromeric chromatin	
125	Basu	Dip1p and the regulation of the formin Cdc12p during cytokinesis in fission yeast	
126	Fraschini	Regulation of septins dynamics and cytokinesis by budding yeast Dma proteins	
127	García-Cortés	Fission yeast Etd1 promotes SIN activation through regulation of Spg1	
128	Santos	The exocyst and the septins interact with the Rho4 GTPase during fission yeast cytokinesis	
129	Votin	Stable membrane assembly of yeast septin collars requires association with PIP2	
130	Doherty	The MAP kinase SMK1 negatively regulates 1,3- $\beta$ -glucan production during spore wall morphogenesis in <i>S. cerevisiae</i>	
131	Mathieson	The role of the meiosis II outer plaque in membrane formation in <i>S. cerevisiae</i>	
132	Onishi	A novel role of the septins during the spore membrane morphogenesis in <i>S. pombe</i>	
133	Slubowski	An evolutionary conserved motif in the Gck-family kinase is required for Sps1p function during sporulation	
134	Suda	The leading edge complex mediates organellar segregation during sporulation	
135	Tachikawa	<i>GIP1</i> is required for prospore membrane extension and has genetic interaction with <i>YSW1</i>	
136	Yan	Regulation of forespore membrane assembly in fission yeast by the Ser-Thr kinases, Slk1p and Sid2p	
137	Verde	Bot1p is required for normal cell morphology, mitochondrial integrity and respiratory function in the fission yeast <i>S. pombe</i>	
138	Sa	The role of the Bar1 protease in yeast mating	

139	JIN	Large-scale deletion and over-expression analysis of filamentous-form growth in budding yeast
140	JIN	Analysis of differential plasma membrane protein abundance during pseudohyphal growth
141	Schmidt	Stretched too thin—The perils of hyperpolarized growth in <i>cak1</i> and <i>cla4</i> mutants
142	Höfken	Proteins involved in sterol synthesis interact with Ste20 and regulate cell polarity
143	Titorenko	Lipid metabolism in peroxisomes, endoplasmic reticulum and lipid bodies controls chronological aging in yeast
144	Zaremborg	Localization study of yeast glycerol 3-phosphate acyltransferases
145	Erdman	A suppression screen identifying novel and related PDR network target genes involved in resistance to membrane disturbing agents
146	Riley	A regulatory connection between genes involved in sphingolipid biosynthesis
147	Angers	Investigating the role of the HOPS complex in AP-3 mediated vesicle trafficking
148	Duncan	Coordination of the Gga and Ent5 clathrin adaptors
149	Fuller	Gga/clathrin-dependent transport from the TGN to the late endosome/prevacuolar compartment
150	Koelling	Analysis of the non-endosomal function of the ESCRT-III protein Snf7
151	Kallay	Exoporide—A small molecule that triggers exosomal dumping of vacuolar contents
152	Nothwehr	Structural features of Vps35p involved in interaction with other subunits of the retromer complex
153	Vincent	Functional characterization of yeast Penta-EF homolog Pef1
154	Needham	Ssa1p (Hsp70) mutations destabilize yeast prions similarly but through different enzymatic mechanisms
155	Nillegoda	Hsp70 chaperone machinery makes triage decisions during protein kinase quality control
156	Michels	Mutant <i>Saccharomyces MAL</i> -activator alleles define distinct in vivo complexes of the Hsp90/Hsp70 chaperone cycle
157	Shewmaker	The nitrogen regulatory function of Ure2p is enhanced by its prion domain
158	Tapia	Starvation-regulated targeting of Hsp90 to the nucleus in quiescence
159	Xie	Identification and characterization of a bipartite signal on misfolded proteins recognized by endoplasmic reticulum associated degradation
160	Bachant	Cell cycle regulation of Smt3/SUMO isopeptidase Smt4/Ulp2 by the polo kinase Cdc5
161	Strich	Ume6 destruction by a two-step proteolysis pathway regulated by PKA and Ime1 is required for meiotic development
162	Schmidt	Small molecule inhibitors of the Rce1p CaaX protease—Impact on in vitro and in vivo activity
163	Harkness	Protein aptamers implicate Cin5p in the regulation of the yeast anaphase promoting complex
164	Shirai	The role of SUMOylation of nucleolar proteins in budding yeast

165	Hood-DeGrenier	Connections between the S-phase cyclin Clb5 and the Target of Rapamycin (TOR) pathway
166	KUMAR	SAH mediated metabolic switch controlling G1 cell cycle regulation in <i>S. cerevisiae</i>
167	Liko	Stb3 and glucose response of <i>S. cerevisiae</i>
168	Lippman	Sch9 mediates TORC1 regulation of ribosome biogenesis
169	Okada	Linkage between ribosome synthesis and cell cycle in budding yeast
170	Schepers	Regulation of trehalase by the mRNA decapping enzyme Dcs1 and the yeast 14-3-3 proteins
171	Schroeder	Control of pseudohyphal growth by the early meiotic cascade
172	Cuthbertson	Synthetic penaeidin antimicrobial peptides target fungicide resistant yeasts
173	Agarwal	Mechanism of action studies on the novel antifungal compound coruscanone A using genomic and genetic approaches
174	Xu	Identification of novel genes involved in resistance to the antifungal agents ketoconazole and caspofungin
175	Al-Qodah	Sandwich non-porous magnetic supports for cell immobilization
176	Hector	Engineering <i>S. cerevisiae</i> for ethanol production from agricultural waste products
177	MacCoss	Improvements in high throughput differential proteomics and its role in the routine analysis of complex protein mixtures
178	Nallaseth	Generic optimization of the <i>P. pastoris</i> expression strain—A mutagenic screen for mutants secreting elevated levels of a reporter protein
179	Vinarov	Yeast-bacteria association for fodder protein production from alcohol waste
180	Hong	Manually curated and computationally predicted GO annotations at the <i>Saccharomyces</i> Genome Database
181	Livstone	P-POD—A database of protein orthology, cross-species complementation data, and disease information
182	Nash	Expanded gene model at the <i>Saccharomyces</i> Genome Database (SGD)
183	Livstone	YFGdb—A functional genomics database containing large-scale data sets from genome-wide experiments in yeast
184	Park	Community Wiki at <i>Saccharomyces</i> Genome Database
185	Skrzypek	Phenotype annotation using controlled vocabularies at the <i>Saccharomyces</i> Genome Database

**Session 7 POLARITY AND MORPHOGENESIS**

FRIDAY 8/17/2007, 7:30 PM

R. Miller

#	<u>Iname</u>	<u>Title</u>	<u>Talk Length</u>
186	Yoshida	GEF is important for the localized activity of Rho1	12
187	Cole	Targeting of the Cdc24p GEF to sites of polarized growth	12

188	Höfken	Regulation of Rho GTPases by RDI1	12
189	Das	Fission yeast Orb6 kinase functionally interacts with Rho-GAP Rga4 in the control of cell polarity	12
190	Howell	Symmetry breaking polarization in <i>S. cerevisiae</i>	12
191	Sagot	Budding without actin	12
192	Kurischko	The essential function of the RAM signaling network	12
193	Jansen	RAM network function in morphogenesis	12
194	Reynolds	Vacuolar protein sorting components affect mat formation by mechanisms that are both dependent and independent of <i>FLO11</i> expression	12
195	Wang	Hyphae specific repression of <i>CHT3</i> expression is regulated by Hgc1/Cdk1 phosphorylation of Efg1 in <i>C. albicans</i>	12

**Session 8 PHYSIOLOGY AND GENOMICS**

SATURDAY 8/18/2007, 9:00 AM

D. Botstein

<u>#</u>	<u>Iname</u>	<u>Title</u>	<u>Talk Length</u>
196	Gresham	Global analysis of genome variation in experimentally evolved yeast	12
197	Levy	Phenotypic capacitors are network hubs in <i>S. cerevisiae</i>	12
198	Kumar	A small molecule-directed approach to control protein localization and function	12
199	Stepanov	Repression of pleiotropic drug resistance genes in <i>S. cerevisiae</i> using chimeric transcriptional repressors—A novel strategy for enhancing drug accumulation in yeast	12
200	Amberg	Structure/function genomics of the actin cytoskeleton	12
201	eldakak	Asymmetric inheritance of a class of plasma membrane prolating fitness or aging determinant?	12
202	Liu	Heat shock response relieves ER stress via multiple pathways	12
203	Voordeckers	Yeast PDK1 orthologues as novel regulators of the nutrient-controlled kinases PKA and Sch9	12
204	Ryan	Comprehensive analysis of fungal dimorphism in <i>S. cerevisiae</i>	12
205	Futcher	Slowly growing cells, stored carbohydrate, and the critical size for Start	12
206	Botstein	Transcriptional and physiological responses to differences in steady-state growth rate	12

**Session 9 ORGANELLE BIOLOGY**

SATURDAY 8/18/2007, 2:00 PM

D. Amberg

<u>#</u>	<u>Iname</u>	<u>Title</u>	<u>Talk Length</u>
207	McDermott	Quantitative 3-dimensional imaging of yeast using soft x-ray tomography	12
208	Edgington	The size of the nucleus increases as yeast cells grow	12
209	Melloy	Distinct roles for key karyogamy proteins in nuclear fusion	12

210	Shen	Protein complexes involved in yeast nuclear fusion	12
211	Garcia	Mitochondria-associated yeast mRNAs and the biogenesis of molecular complexes	12
212	Jin	Roles of a protein phosphatase in the regulation of organelle inheritance	12
213	Hardy	The budding yeast p21 activated kinases, Cla4 and Ste20, regulate vacuole inheritance	12
214	van der Zand	The birth of a peroxisome	12
215	Titorenko	An intraperoxisomal signaling cascade initiates peroxisome division by triggering the stepwise remodeling of lipid composition of the peroxisomal membrane	12

**Session 10 SIGNALING**

SUNDAY 8/19/2007, 9:00 AM

J. Thorner			
<u>#</u>	<u>Iname</u>	<u>Title</u>	<u>Talk Length</u>
216	Singh	The role of Rho5 GTPase in oxidant-induced cell death	12
217	Mazanka	Control of Ace2 segregation by Cbk1 phosphorylation	12
218	Bao	Recognition of a two-phosphate phosphodegron by Cdc4 is required for Tec1 destruction and MAP kinase signaling specificity	12
219	Cunningham	Non-apoptotic death of yeast cells during the response to ER stress and antifungal drugs	12
220	Cullen	Cleavage-dependent activation of a signaling mucin in yeast	12
221	Castermans	Active Ras is required for stimulation of adenylate cyclase activity by G $\alpha$ protein homologue Gpa2 in budding yeast	12
222	O'Donnell	Arrestin development in yeast—Function and regulation of yeast arrestins	12
223	Ydenberg	Fus2p nuclear localization is regulated by mitotic growth and pheromone signaling	12
224	Grote	Ergosterol promotes pheromone signaling and plasma membrane fusion in mating yeast	12
225	Thorner	Signal-induced anisotropy in plasma membrane phosphatidylinositol-1,5-bisphosphate distribution is essential for signaling in the yeast mating pheromone response MAPK cascade	12