

## INDEX

absolute methanol, 149	Babes, Aurel, 4	CGH (comparative genomic hybridization),
acetone, 149	background changes	180-2
acini (polypoid or papillary fragments), 31-4	amyloid, 90	chromatin
adenocarcinoma, 28, 174	calcification, 89	diagnostic features, 71–2
bronchoalveolar, 117	clean background, 92	hematoxylinophilic, 71–2
cytoplasm, 112	diagnostic features, 84–92	ciliary tufts detachment, 38, 139
definition, 173	epithelial cells, 131–2	ciliated cell metaplasia, 18-20
endocervix, 112–15	ghost cells, 88	ciliated columnar epithelial cells, 29
endometrium, 114–16	inflammation, 88	ciliocytophthoria, 38, 139
functional differentiation characteristics,	lymphorrhagia, 91	CISH (chromogenic in-situ hybridization),
110–18	mucopolysaccharide-rich background, 90	180–2
nucleus, 111	presence of old blood, 85–8	columnar epithelial cells
ovarian, 117	rouleau formation, 90	acini (polypoid or papillary fragments), 31-
urine diagnosis, 144	tigroid background, 87–90	bile-duct, 43
alcohols for fixation. See fixation and specimen	Barr body, 15, 21	body site-specific cell types, 36–54
processing	basal/reserve cells, 20	brush border cells, 30
amyloid material in the background, 90	Beale, Lionel S., 1–2	ciliated cells, 29
ancillary techniques, 162–82	bile-duct	
carcinomas, 173–5		conduit monitoring, 42
	columnar epithelial cells, 43	Creola bodies (pseudo-pearls, 37–40
cell lineage elucidation, 166–7	BK virus, 144	ducts and stalks, 35–6
CGH (comparative genomic hybridization),	blue blobs	endocervix, 36
180–2	small-cell undifferentiated carcinoma, 119	endometrium, 39
CISH (chromogenic in-situ hybridization),	type of squamous cell, 17	foam cells (mammary), 43–5
180–2	body cavity fluids	gastric, 38–40
cytogenetic techniques, 180–2	degenerated mesothelial cells, 141	general features, 25–7
cytokines and growth factors, 179-80	diagnosis of epithelial function,	histiocytic, 52–4
DNA and tissue arrays, 179	140–3	intestinal, 40–1
electron microscopy, 163-4	diagnostic challenges, 140	mammary cells, 43–4
epithelial neoplasms, 173–5	eosinophilia, 143	mesothelial, 49-56
FISH (fluorescent in-situ hybridization),	malignant cells, 143	multicellular tissue formations, 30-6
180–2	normal mesothelial cells, 141	nipple secretions, 43–4
flow cytometry, 175–7	reactive mesothelial cells, 141–3	non-secretory cells, 28
germ cell tumors, 168-9	bronchoalveolar adenocarcinoma, 117	pancreatic acinic, 41–3
hematopoietic neoplasms, 167-8	brush border columnar cells, 30	pancreatic ductal, 41-3
histochemical special stains, 164		passive lining cells (mammary), 43-5
image analysis, 175–8	calcification, 89	polypoid or papillary fragments
immunofluorescent techniques, 164-5	cannibalization	(acini), 31–4
immunohistochemistry, 165-6	squamous cells, 24-5	polyps, 33–5
immunomarkers, 176	Carbowax <sup>™</sup> , 153–7	renal tubular, 46-7
karyotyping, 180	carcinoma-in-situ, 104-7	respiratory, 37–41
melanotic tumors, 168	carcinomas, 173-5	secretory cells, 27–8
mesenchymal tumors, 169-72	classification, 173-4	sheets of cells, 30–1
mesothelial proliferations, 172–3	differential diagnosis, 173-4	transitional (urothelial), 44-7
microsatellite analysis, 181	main categories, 173–4	unicellular maturation (differentiation),
molecular analysis, 178	cell lineage elucidation, 166–7	27–30
multimodal approach, 162–3	cellular activity	urothelial, 44–7
sarcomas, 169–72	and nuclear morphology, 7	conduit monitoring, 42
scanning electron microscopy, 163–4	functional activities, 7	Creola bodies, 37–40
search for the primary site, 176	growth activities, 7	cystectomy conduit monitoring, 42
site-specific markers, 176	cellular preparations	cytogenetic techniques, 180–2
telomerase activity detection, 180–1	quality of, 66	cytokines and growth factors, 179–80
ultrastructural examination, 163–4	cervical cancer, 4	cytomegalic inclusion disease, 144–5
		-,



INDEX

cytoplasm	perinuclear halos and acidophilia, 139	Graham, Ruth, 4, 95
indication of functional differentiation, 7	pseudosyncitial formations, 140	growth cycle
malignancy diagnostic features, 85	retroplastic changes in cells, 131-2	and nuclear morphology, 7
secretory columnar cells, 27-8	urine diagnosis, 140, 143-5	growth factors and cytokines, 179-80
cytoplasmic differentiation. See functional	vacuolation of the cytoplasm, 138-9	
differentiation in cancer	epithelial neoplasms, 173-5	hematopoietic neoplasms, 167-8
cytoplasmic structure	adenocarcinoma, 173, 174	histiocytes
normal cells, 14	classification, 173-4	multinucleation, 59-63
Cytospins®, xi	differential diagnosis, 173-4	histiocytic cells, 52-4
· •	glandular neoplasms, 174	histiocytic cells reflex response, 54-9
decidual cells, 22	immunomarkers, 176	mitoses, 55
Diff-Quik™ stain, xi, 5	main categories, 173-4	nuclear changes, 54-60
DNA and tissue arrays, 179	markers of squamous differentiation, 174-5	phagocytosis, 55–9
Donné, Alfred, 1	neuroendocrine carcinoma, 173, 175	histochemical special stains, 164
ducts (shed tissue), 35-6	site-specific markers, 176	history of cytohistology, 1-5
dyskaryotic epithelial cells, 127, 129-31	squamous cell carcinoma, 173, 174-5	hormonal evaluation of cytology
, , ,	undifferentiated carcinoma, 173	specimens, 22–3
ectopic tissue occurrence, 82-4	epithelioid cell tumors, 171	hyperkeratotic squamous cells, 14–15
Ehrlich, Paul, 1, 2	euplasia. See normal cell morphology	hypermature squamous cells, 14–15
electron microscopy, 163-4	euplastic cellular activity, 7	hyperplasia, 127
endocervix	Ewing, James, 5	hypertrophy, 127
adenocarcinoma, 112–15	3,7,4	71 1 1/
columnar epithelial cells, 112–15	fine needle aspiration (FNA)	image analysis, 175–8
endometrium	cytological evaluation, 4–5	immunofluorescent techniques, 164–5
adenocarcinoma, 114–16	FISH (fluorescent in-situ hybridization), 180–2	immunohistochemistry, 165–6
columnar epithelial cells, 39	fixation and specimen processing, 148–61	immunomarkers
epidermal inclusion cysts, 14	air-drying and rehydration of unprotected	epithelial neoplasms, 176
epithelial functional alterations, 127–45	cells, 150–1	inflammation, 88
apoptosis, 136–7	air-drying of protected fixed cells, 149–50	intercellular cytoplasmic bridges, 102
background changes, 131–2	alternatives to the standard method, 149, 157	intercellular molding, 78–81
body cavity fluids, 140–3	approach to cytopreparation, 151–2	intermediate squamous cells, 15–16
cell fixation effects, 133	Carbowax <sup>TM</sup> , 153–7	intestinal columnar cells, 40–1
changes in chromatinic material, 135–7	cell flattening, 152–7	intracytoplasmic inclusions, 77
chromasia in degenerating nuclei, 134	cell shrinkage, 152–7	intranuclear grooves, 78
	Papanicolaou method, 148–9	intranuclear grooves, 78 intranuclear inclusions/invaginations, 77
chromatin clumping, 135 chromatin degeneration, 135–7	polyethylene glycol (PEG), 153–7	invasive carcinoma
chromatin degeneration, 135–7	preservation, 151	
	•	squamous cell carcinoma, 110
chromatin margination, 136	standard wet-fixation method, 148–9	isopropanol, 149
chromatolysis, 136–7	substitute alcohols, 149	1
cytoplasm of reactive cells, 127–8	technical notes and tips, 157–60	karyotyping, 180
cytoplasmic degeneration, 137–40	fixation effects	Koss, Leopold G., 4
cytoplasmic vacuolation, 138–9	epithelial cells, 133	1 11 1100 11 1 1 1 1 1 1 1
decreased functional activity, 131–40	flow cytometry, 175–7	large-cell undifferentiated carcinoma, 121–2
degenerative changes in cells, 131–2	fluorescent dyes, 4	cell groups, 121
diagnostically challenging body sites, 140–5	foam cells (mammary), 43–5	cytoplasm, 121
differentiation in degeneration, 139	Frost, John K., xi, 4, 66	nucleus, 121
dissolution of the cytoplasm, 139	functional differentiation	pleomorphism, 121
dyskaryotic reactive cells, 127, 129–31	and cytoplasmic appearance, 7	light microscopy, 163
fraying of the cytoplasm, 138	functional differentiation in cancer, 95–123	Lopes-Cardozo, Paul, 5
general features, 127	adenocarcinoma, 110–18	Löwhagen, Trosten, 5
hyperplasia, 127	gastrointestinal stromal tumor (GIST), 123	lung
hypertrophic changes, 127	general features, 95	small-cell undifferentiated carcinoma,
increased functional activity, 127-31	large-cell undifferentiated carcinoma, 121–2	119, 121
loss of cilia or processes, 139	melanoma, 122	lymphorrhagia, 91
loss of cytoplasmic processes, 139	mesenchymal tumors, 121–3	
multinucleation in reactive cells, 131	nature of cytoplasmic differentiation, 95	malignant cell morphology, 66-91
nuclear degeneration, 133-8	small-cell undifferentiated carcinoma, 119-21	approach to diagnosis, 66-7
nuclear membrane degeneration, 135	squamous cell carcinoma, 95-110	background changes, 84-92
nuclear membrane of reactive cells, 129		cells within tissue fragments, 82
nuclear size alteration, 133	gastric columnar cells, 38-40	changes in malignant cells, 67-92
nucleoli, 129	gastrointestinal stromal tumor (GIST),	chromatin (hematoxylinophilic), 71-2
nucleoli degeneration, 138	123, 169	cytoplasmic features, 85
nucleus of reactive cells, 128-9	germ cell tumors, 168-9	ectopic tissue occurrence, 82–4
nucleus size in reactive cells, 128	ghost tumor cells, 88	extremes in structures, 67
parachromatin clearing, 137	glandular neoplasms, 174	high N/C ratio, 67-8
parachromatin in reactive cells, 130	Gleevec, 169, 178	intercellular molding, 78-81



## INDEX

malignant cell morphology (cont.)	Novak, Emil, 4	rouleau formation, 90
intercellular relationship, 78-83	nuclear changes	Sani, Guelfo, 4
intranuclear grooves, 78	histiocytic cells reflex response, 54-60	sarcomas, 169–72
intranuclear inclusions/invaginations, 77	nuclear membrane (envelope)	epithelioid cell tumors, 171
irregularity of structures, 67	diagnostic features, 72–3	pleomorphic neoplasms, 171–2
malignant criteria, 66–7	nuclear morphology	small blue round cell tumors, 169-70
mitosis, 70	and the growth cycle, 7	spindle cell tumors, 170–1
multinucleation, 83	indicator of cellular activity, 7	tumors defined by cellular features,
no single diagnostic cytologic feature, 66	nuclear structures (normal cells), 11–14	169–71
nuclear chromasia, 68–70	chromasia, 11	scanning electron microscopy, 163–4
nuclear features which should be examined,	chromatin pattern, 11	secretory columnar cells, 27–8
69–78	chromatinic network, 13	sex chromatin, 15
nuclear membrane (envelope), 72–3	hematoxylinophilia, 11	sex chromocenter, 20
nucleocytoplasmic relationship, 77–8	nucleolus, 13	sheets of columnar cells, 30–1
nucleoli, 73–4	parachromatinic material, 13	signet cell formation, 28
nucleus, 67–78	size and shape, 12	site-specific markers, 176
parachromatin (nuclear sap), 72	symmetry of distribution, 13	Sixten, Franzen, 5
quality of cellular preparations, 66	nucleocytoplasmic relationship, 77–8	small blue round cell tumors, 169–70
sharp angularity of structures, 67	nucleoli	small round blue cell tumor, 121
malignant criteria, 66–7 mammary foam cells, 43–5	diagnostic features, 73–4 normal cell morphology (euplasia), 13	small-cell undifferentiated carcinoma, 119–21
mammary passive lining cells, 43–5	nucleus	"blue blobs", 119
	chromasia, 68–70	body sites, 121
Martin, Hayes, 4 melanoma, 122	high N/C ration, 67–8	cell groups, 120
melanotic tumors, 168	malignant cell morphology, 67–78	cytoplasm, 121
mesenchymal tumors, 121–3, 169–72	mangnant cen morphology, 07–78	nucleus, 120
mesothelial cells, 49–56	old blood	pulmonary, 119, 121
mesothelial proliferations, 172–3	presence of, 85–8	small round blue cell tumor, 121
metaplastic squamous cells, 17–20	ovarian adenocarcinoma, 117	Söderström, Nils, 5
methanol, 149	Ovarian adenocaremonia, 117	specimen processing. See fixation and specimen
methylene blue stain, 5	pancreatic acinic cells, 41–3	processing
microinvasive carcinoma, 107–8	pancreatic ductal cells, 41–3	spindle cell tumors, 170–1
microsatellite analysis, 181	Papanicolaou method of fixation	squamous cell carcinoma, 2–4
Millipore <sup>®</sup> filters, xi	and staining, 148–9	atypical cytoplasmic thinning, 99–101
mitosis	Papanicolaou stain, xi, 5	carcinoma-in-situ (third type) cell, 104–7
abnormal, 70	Papanicolaou, George, 2–4, 38, 95, 127	color of cytoplasm, 100
histiocytic cells reflex response, 55	papillary transitional cell carcinoma, 144	cytoplasmic characteristics, 97–103
molecular analysis, 178	parabasal squamous cells, 16–17	definition, 173
mucopolysaccharide-rich background, 90	parachromatin (nuclear sap)	endoplasm/ectoplasm cytoplasmic
Muller, Johannes, 1	diagnostic features, 72	separation, 97
multinucleation	passive lining cells (mammary), 43-5	fiber cell formation, 99-101
diagnostic value, 83	Patten, Stanley R., 4	fiber cell type, 95, 103-5
histiocytes, 59-63	pearl/pearly-body formation in squamous	functional differentiation characteristics,
reactive epithelial cells, 131	cells, 22-4, 101-2	95–110
Murayama, Hashime, 2	phagocytosis	hyalinization of the ectoplasm, 97
	histiocytic cells reflex response, 55-9	intercellular cytoplasmic bridges, 102
Naylor, Bernard, 4	squamous cell carcinoma, 101-2	invasive carcinoma, 110
neoplastic cellular activity, 7	pleomorphic neoplasms, 171–2	karyopyknosis, 95–7
neuroendocrine carcinoma, 175	polychromatic stain, xi	keratinization cell border, 97
definition, 173	polyethylene glycol (PEG), 149	keratinizing clumps in the cytoplasm, 98
non-secretory columnar cells, 28	polypoid or papillary fragments (acini), 31-4	markers of squamous differentiation, 174–5
normal cell morphology (euplasia)	polyps, 33–5	microinvasive carcinoma, 107–8
cell as a whole, 7–13	post-partum cells, 16	nuclear pyknosis, 95–7
cells derived from the same clone, 8	proplasia, 95	"pearl" formation, 102
columnar epithelial cells, 25–58	proplastic cellular activity, 7 pseudo-pearls (Creola bodies), 37–40	phagocytosis, 101–2
cytoplasmic structure, 14	pseudo-pearis (Creoia bodies), 37–40	ringing/lamination in the outer cytoplasm, 99
early reactive changes, 8 general features of the cell, 7–11	Dancer James M. 4	spindle cell formation, 99–101 spindle cell type, 103–5
normal euplastic "resting" cell, 10	Reagan, James W., 4 reagent alcohol, 149	tadpole cell formation, 99–101
nuclear structures, 11–14	_	tadpole cell type, 95, 102–3
overlap with atypical or neoplastic features, 8	renal tubular columnar cells, 46–7 reserve cells, 20	tail formation in the cytoplasm, 99–101
physiological adaptive changes, 8	respiratory system	third type (carcinoma-in-situ) cell, 104–7
predictable features of healthy cells, 10	columnar epithelial cells, 37–41	third type of cell, 95
roundedness of healthy cells, 8–10	retroplasia, 95	squamous cells (stratified epithelium), 14–25
squamous cells (stratified epithelium), 14–25	retroplastic cellular activity, 7	Barr body, 21
uniformity of healthy cells, 10–11	Romanowsky stains, 2, 5	cannibalization, 24–5
, ,,	· · · · / · · · · · / ·	



## INDEX

decidual cells, 22 general features of normal cells, 14 germinal basal cells, 20 hormonal evaluation, 22-3 hyperkeratotic cells, 14-15 hypermature cells, 14-15 intermediate cells, 15-16 metaplastic cells, 17-20 parabasal cells, 16-17 pearl/pearly-body formation, 22-4 reserve cells, 20 sex chromocenter, 20 superficial cells, 15-16 trophoblastic cells, 22 stains, xi introduction of, 2 stalks (shed tissue), 35-6 Stockard, Charles, 2 stratified epithelium. See squamous cells sub-areolar abscess in the breast, 14

SurePath<sup>TM</sup>, xi

Tamoxifen, 22
telomerase activity detection, 180–1
ThinPrep®, xi, 181
tigroid background, 87–90
tissue fragments
malignant criteria, 82
transitional (urothelial) columnar
cells, 44–7
Traut, Herbert, 148
trophoblastic cells, 22

Ultrafast Papanicolaou stain, 5
ultrastructural examination, 163–4
undifferentiated carcinoma

definition, 173

large-cell, 121–2 small-cell, 119–21

superficial squamous cells, 15-16

urine adenocarcinoma, 144 cytomegalic inclusion disease, 144-5 detection of urothelial carcinoma, 181 diagnostic challenges, 140 epithelial function diagnosis, 143-5 normal urothelial cells, 143 papillary transitional cell carcinoma, 144 viral infections, 144-5 urothelial carcinoma detection, 181 urothelial columnar cells, 44-7 UroVysion™ Bladder Cancer Kit, 181 viral infections, 144-5 Wied, George, 4

Zajicek, Joseph, 5