

# Contents

<i>Preface</i>		vii
<b>Chapter 1</b>	<b>An Introduction to Playing God</b>	<b>1</b>
	Genetically modified (GM) human embryos	1
	You're only human ... but your kids could be more	1
	On the menu: IVF meets GMO	10
	Cutting edge technology: CRISPR-Cas9	11
	Your better baby	15
	GMO genesis	20
	The stem cell and cloning connections	23
	References	25
<b>Chapter 2</b>	<b>The Birth and Explosive Growth of GMOs</b>	<b>27</b>
	GM plants sprout	27
	Where did GMOs come from?	29
	The race for GM crops	35
	Democratizing creation	40
	GM pets and novelties	41
	GM mosquitoes as good "weapons" to fight disease	42
	Defining human genetic modification	44
	Gene therapy	46
	References	48

<b>Chapter 3</b>	<b>Human Cloning</b>	<b>49</b>
	A student and the first clone	49
	Cloning culture	50
	The birth of cloning	51
	The two kinds of cloning	58
	Phony cloning	60
	Cloning myths	63
	The politics of cloning	67
	De-extinction: resurrecting the extinct	68
	Cloning meets GMOs?	70
	Cloners and friends	70
	Who will be the first human clones?	73
	References	75
<b>Chapter 4</b>	<b>Messing with Mother Nature:</b>	
	<b>The First GMO Sapiens</b>	<b>77</b>
	The birth of IVF and a devilish dilemma	77
	The “cowboys of medicine” make first GM babies	86
	Would it be legal to make a GMO sapiens?	95
	Monkeying around with primate eggs and genomes	99
	The future of three-person IVF	101
	References	102
<b>Chapter 5</b>	<b>Build-a-Baby Better via Genetics</b>	<b>105</b>
	The genesis of commercial human genetic testing	105
	Genetics dating and mating service: I prefer a child with ...	108
	Changing the genetic equation via designer babies?	112
	Preimplantation genetic diagnosis (PGD)	118
	CRISPR versus PGD	120
	Sex selection	123
	Savior siblings	124
	Human GMO economics	125
	OvaScience	127
	Mitogenome therapeutics	129

	Genetics and human choices	131
	Genetic tourism	131
	Are designer babies the next step on the GM timeline?	133
	References	135
<b>Chapter 6</b>	<b>DIY Guide to Creating GMO Sapiens</b>	<b>137</b>
	Why make a GMO sapiens and what is your target?	138
	The CRISPR connection	139
	CRISPR as a laboratory tool	141
	In the laboratory, begin at the beginning	146
	A la carte genetic modifications	147
	A potential role for stem cells	149
	Build a better mouse and they will come: the experience of making a GMO	150
	What if you make a mistake?	152
	What could go wrong	153
	Could we correct a mistake?	156
	Practical challenges to making a GMO sapiens	158
	References	160
<b>Chapter 7</b>	<b>Eugenics and Transhumanism</b>	<b>163</b>
	Eugenics takes root in California	163
	“Better babies” through eugenics	166
	IVF and eugenics	172
	What is a “better” or “perfect” person?	174
	Should we try to make “better babies” via genetic modification?	176
	Transhumanism: Getting from point ACGT to H+	181
	George Church, genetics pioneer and transhumanist	185
	Forced genetic change: gene drive, and weapons	190
	References	198

<b>Chapter 8</b>	<b>Cultural Views on Human Genetic Modification</b>	<b>201</b>
	Public perceptions of human modification	201
	American views on creating GM humans	202
	Global views on human genetic modification	204
	Frankenstein revisited	207
	The Brothers Huxley	208
	<i>GATTACA</i>	210
	<i>DNA Dreams</i> and reality	212
	<i>Orphan Black</i>	216
	An artist's view of human cloning	218
	Genetic discrimination or celebrity	218
	Gender issues in human modification	221
	Letting your GMO imagination run wild	223
	How will culture view real GMO sapiens?	225
	References	226
<b>Chapter 9</b>	<b>GMO Sapiens Today and Tomorrow</b>	<b>227</b>
	Creation of the first gene-edited human embryos	227
	“Don't edit the human germline”	231
	“Prudent path forward”	232
	ABCD plan	239
	Stanford Law meeting on human genetic modification	242
	George Church on human genetic modification	244
	Oxford ethicists: don't worry, just do it!	246
	The human genome as ever-changing mashup?	249
	The future of human genetic modification	251
	References	256
	<i>Glossary</i>	257
	<i>Index</i>	263