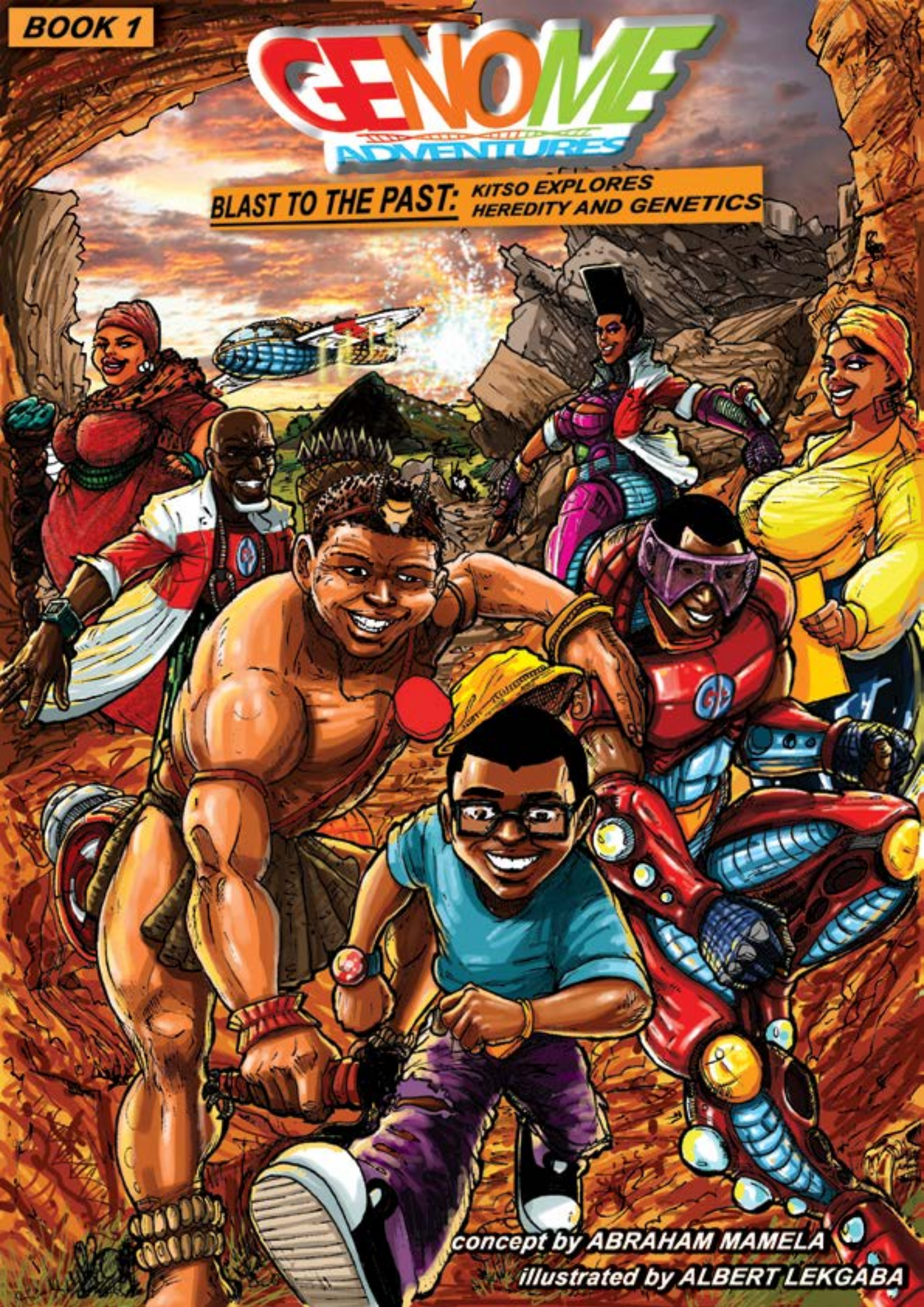


BOOK 1

GENOME

ADVENTURES

BLAST TO THE PAST: KITSO EXPLORES
HEREDITY AND GENETICS



concept by **ABRAHAM MAMELA**

illustrated by **ALBERT LEKGABA**

FOREWORD



Investment in research and development has proven to be a driving factor for economies in developed countries and is included on the African Union agenda as a solution to poverty and other socio-economic problems. There is a consensus that supporting science and technology will contribute to the creation of knowledge economies in Africa. Indeed, science communication and engagement can bridge the knowledge gap between academia and the general public in Botswana and elsewhere.

"Where Science Meets Fun" is the motto of Genome Adventures, an innovative Wellcome Trust-funded community engagement initiative of the Collaborative African Genomics Network (CAfGEN). CAfGEN is a member of the Human Heredity and Health in Africa Consortium (H3Africa) and is coordinated by the Botswana-Baylor Children's Clinical Centre of Excellence (COE)- a key partner to the Ministry of Health. Genome Adventures utilizes capacity building workshops, educational comics, and social media to engage community stakeholders, media practitioners, and the general public - especially the youth – in furthering the understanding of genomics and biomedical research.

This four-part Genome Adventures comic book series aims to educate readers on the history of heredity and genetics, the structure and function of DNA and genes, the link between genomics and health, and the process for enrolling in a biomedical or genomics research study, including ethical issues pertaining to informed consent, sample shipping and storage, and community engagement.

This first issue of the Genome Adventures comic book series - Blast to the Past: Kitso Explores Heredity & Genetics – is the result of many months of development by a diverse team of writers, editors, reviewers, and advisors. The team's collective love for biomedical science, African history, Botswana, and the important role of women in science shines through the pages of this book.

I would like to acknowledge the Wellcome Trust for supporting Genome Adventures and to thank them for their vision "to improve health by supporting bright minds in science, the humanities and social sciences, and public engagement." I would also like to thank all members of the Genome Adventures team and appreciate the generosity of The Botswana Gazette newspaper, and the Printing & Publishing Company Botswana (PPCB) for assisting with printing and distribution of the comic books. Last but not least I want to thank the Botswana-Baylor Children's Clinical Centre of Excellence for bringing together this wonderful and innovative endeavor.

Science should no longer be seen as being confined solely to laboratories. Rather it should become an integral part of our daily lives and each of us should participate in its development. This approach of simplifying complex scientific concepts and communicating them in an educative yet entertaining way is an important step towards achieving that reality. Each Botswana, young or old, who reads these books, will be taking our beloved country a step closer to closing our Vision 2016 Pillars of an Educated, Informed and compassionate, just caring nation

A stylized white signature of Dorcas K Makgato on a dark background.

Dorcas K Makgato
MINISTER OF HEALTH
REPUBLIC OF BOTSWANA

KITSO



HII MY NAME IS KITSO! I LIVE IN TLOKWENG WITH MY AUNT. I LOVE ADVENTURES! I WAS BORN WITH HIV, BUT THAT DOESN'T SLOW ME DOWN!

DR. MABOKO



I AM THE LEADER OF THE GENOME ADVENTURES SQUAD (NO MATTER WHAT KGOSIGADI TELLS YOU!). I HAVE AMAZING POWERS TO GO THROUGH WALLS AND TELEPORT WITH MY SCOOTER. AND THAT'S NOT ALL - I AM A MIND READER, TOO!

KGOSIGADI



I AM AN OUTSPOKEN LADY AND A TRUE LEADER OF MY PEOPLE, THE BATSWANA! I MIGHT LOOK LIKE YOUR AVERAGE GRANDMOTHER, BUT MY WALKING STICK CONTAINS SPECIAL POWERS FROM MY ANCESTORS! WITH THESE POWERS, I CAN CONTROL THE WEATHER, DIRECT ANIMALS, AND DO OTHER AMAZING THINGS!

PHODISO

MY NAME IS PHODISO, BUT YOU CAN CALL ME "AUNTY". I ADOPTED MY SISTER'S CHILD, KITSO, AFTER SHE PASSED, BUT I LOVE KITSO THE SAME AS MY OTHER CHILDREN! WE LIVE TOGETHER IN TLOKWENG, JUST OUTSIDE GABORONE - WE MIGHT EVEN BE YOUR NEIGHBOURS!



XGAO-TCGAI

TCGAI! MY NAME IS XGAO-TCGAI (OR "XT" FOR SHORT). I'M A PROUD SAN MAN - SOME PEOPLE CALL MY PEOPLE "BUSHMEN" OR "BASARWA". I'M ALSO A SUPERHERO WITH TIME-TRAVELLING POWERS! MY NAME LITERALLY MEANS "BLADE-VISION" BECAUSE MY SIGHT IS AS SHARP AS A KNIFE AND I CAN EVEN SEE INTO THE FUTURE!



MARANYANE

JUST LIKE MY NAME, MARANYANE, I LOVE TECHNOLOGY. CHECK OUT MY BODY! PART OF IT IS A MACHINE AND THE OTHER PART IS HUMAN. I AM SUPER-SMART AND I LOVE USING THE LATEST GADGETS!



MMATLI

MY NAME IS MMATLI. I AM A RESEARCHER! I ALSO HAVE SUPERPOWERS TO SHRINK THINGS TO MICROSCOPIC SIZE, INCLUDING HUMANS! I LOVE THE AMAZING THINGS THAT SCIENCE HELPS US DISCOVER AND I WOULD LOVE TO SEE MORE YOUNG GIRLS IN BOTSWANA BECOME SCIENTISTS, JUST LIKE ME!



ONE MORNING AT THE PLAYGROUND
OF THE KSGALAGADI CHILDREN'S
CLINIC, A CLINIC FOR CHILDREN WITH HIV...



KITSO! IT'S TIME



COMING!



THE DOCTOR IS
WAITING FOR YOU.

HELLO, DR. TAPIWA.

HELLO, PHODISO, HOW ARE YOU?

I'M WONDERFUL, THANK YOU.



AND YOU, YOUNG MAN, HOW HAVE YOU BEEN?



VERY WELL, **AMMA**. I WAS JUST PLAYING WITH FRIENDS.

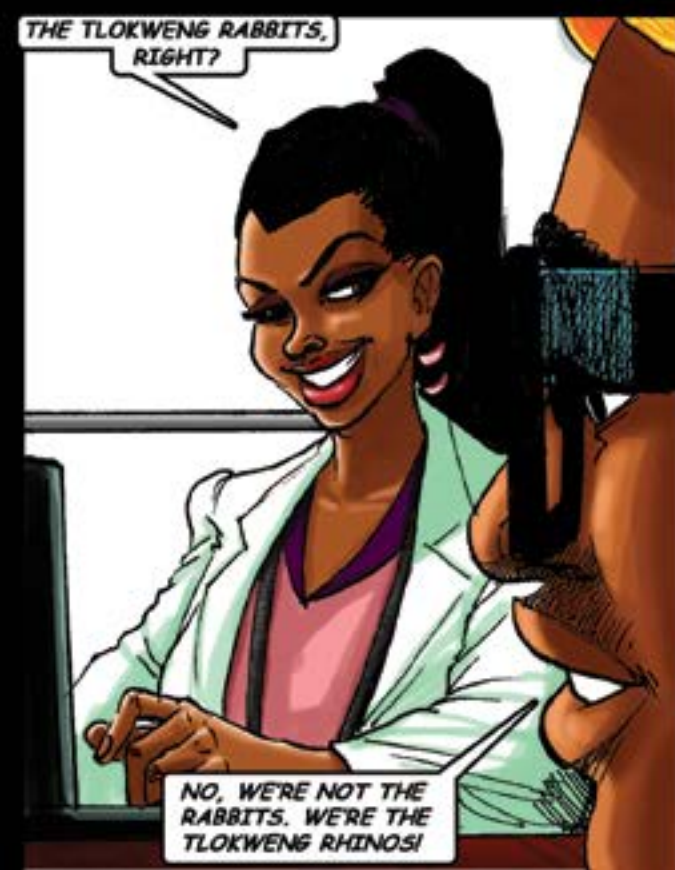
SOUNDS LIKE GOOD EXERCISE.



AREN'T YOU ON THE FOOTBALL TEAM IN YOUR VILLAGE?



THE TLOKWENG RABBITS, RIGHT?



NO, WE'RE NOT THE RABBITS. WE'RE THE TLOKWENG RHINOS!

DO YOU THINK YOUR TEAM COULD BEAT THE ZEBRAS, BOTSWANA'S NATIONAL TEAM?



OF COURSE THE RHINOS COULD BEAT THE ZEBRAS.

HAHAHA! REALLY? GOOD LUCK WITH THAT!

YOUR CD4 COUNT AND
VIRAL LOAD LOOK
GOOD, CHAMPI

DO YOU KNOW WHAT
THAT MEANS? IT MEANS
YOU ARE AS HEALTHY
AS A RHINO.

AND SINCE YOU ARE
HEALTHY, WE WOULD LIKE
TO INVITE YOU TO JOIN
A STUDY.

HERE, TAKE THIS HOME
AND READ IT WITH
YOUR AUNTY.

THEN LET US KNOW IF
YOU WANT TO JOIN.

KEEP PLAYING AND PRACTISING
HARD, CHAMP. THE ZEBRAS
CAN BE HARD TO DEFEAT.

I WILL, DOCTOR,
BYE BYE.

SEE YOU NEXT TIME.





AND SINCE YOU ARE HEALTHY, WE WOULD LIKE TO INVITE YOU TO JOIN A STUDY.



TAKE THIS LETTER HOME....BE SURE TO UNDERSTAND IT.



AUNTY, I HAVE BEEN THINKING ABOUT THAT LETTER WE GOT FROM THE DOCTOR.

HMMM, REALLY?



WHAT'S THE STUDY ABOUT?

THERE'S ONLY ONE WAY TO FIND OUT.



DEAR CAREGIVER, THIS LETTER SERVES TO INVITE YOUR CHILD TO PARTICIPATE IN A RESEARCH STUDY...



TO HELP US LEARN MORE ABOUT THE EFFECTS OF GENES ON HOW QUICKLY CHILDREN WITH HIV AND TB GET SICK FROM THEIR INFECTIONS.

DEAR CAREGIVER,

THIS LETTER SERVES TO PARTICIPATE IN A RESEARCH STUDY TO HELP US LEARN MORE ABOUT GENES ON HOW HIV AND TB GET SICK



FIRST WE WILL TAKE BLOOD SAMPLES...

EISHI WHY DO THEY WANT TO TAKE MY BLOOD?!



BECAUSE THEY WANT TO LEARN MORE ABOUT HOW CHILDREN LIKE YOU GET SICK FROM HIV AND TB.

BUT WHY DO THEY NEED MY BLOOD TO DO THAT?



BECAUSE...



AND WHAT ARE GENES?



UMM...



I SHOULD HAVE NAMED YOU DIPOTSO - MR. QUESTIONS!



JUST TAKE THE LETTER TO YOUR ROOM AND SLEEP ON IT.



WE CAN MAKE OUR DECISION IN THE MORNING.



CAN'T FALL ASLEEP...



MUST READ THE LETTER.





I AM DR. MABOKO.
I CAN READ YOUR
MIND AND KNOW
WHAT YOU'RE
THINKING

AND RIGHT NOW, I
KNOW YOU'RE THINKING
ABOUT THAT LETTER.
WE'RE HERE TO HELP.



I'M KGOSIGADI. DR. MABOKO
THINKS HE'S RUNNING THE
SHOW BUT I'M THE REAL
LEADER OF THIS GROUP.

WITH MY **THOBANE**
WALKING STICK, I
POSSESS ALL
THE WISDOM AND
POWERS OF MY
ANCESTORS.



I'M MMATLI, I WILL
TEACH YOU ABOUT THE
HUMAN SECRET CODE. MY
POWERS CAN MAKE YOU
SUPER SMALL SO THAT
PEOPLE CAN'T SEE YOU.



WHOOAAHI REALLY? LIKE
MAGIC! AND YOU,
WHAT CAN YOU DO?



SHHHHHH.....I AM XGAO TCGAI.
YOU CAN CALL ME XT.
I CAN MAKE YOU
DISAPPEAR AND TRANSPORT
YOU TO STRANGE
PLACES.



DON'T WORRY WE WON'T
HURT YOU.



WE'RE HERE TO
TAKE YOU ON AN
ADVENTURE!



AN ADVENTURE?
I LOVE ADVENTURES!



SHALL WE GO OUTSIDE
AND MEET ANOTHER MEMBER
OF OUR TEAM, AND
TAKE A RIDE ON
OUR HELIX CRUISE?



DON'T WORRY, KITSO,
YOU'RE SAFE WITH
US. YOUR AUNTY WILL
NEVER EVEN NOTICE
YOU'RE GONE. REMEMBER,
I CAN READ YOUR MIND.



LET'S ALL HOLD HANDS!



NCII X'ÀÈ DI TSI C'ÈE TSEÈ, SÈÈ NAKA TSARI TS'ÈNÈAN Q'OO KOE QABÌA
TCÀÀ TA A, NAKA NCII KURI DI NE KHÓÈ NE SITA DI NE KOE UÚ TA A. *



FIRE FROM ENDLESS TIME...



WRAP US IN YOUR SMOKE AND
SEND US BACK TO THE
TIME OF OUR
FOREFATHERS!



XT'S CHANT IS IN NARO, A KHOE LANGUAGE SPOKEN IN THE
GHANZI DISTRICT OF BOTSWANA AND EASTERN NAMIBIA. AN
APPROXIMATE ENGLISH TRANSLATION FOLLOWS.



WELCOME TO MY LOVELY
CRUISE SHIP!
PLEASE SIT DOWN
AND BUCKLE UP.

GÚU TSI NCÁMAI
YOURS? PLEASE! DON'T
GET A BIG HEAD!

WE'RE GOING TO
TSODILO HILLS NOW.
MARANYANE, I CAN
TAKE IT FROM HERE.

WAIT A MINUTE,
I'M THE BETTER
DRIVER. WHY SHOULD
YOU TAKE OVER?

BECAUSE WE'RE GOING
TO MY HOME REGION.
LISTEN, **MOSIMANE**, DO
YOU THINK I CAN'T
FLY?

ONE MORE WORD FROM
YOU AND YOU'LL FIND
YOURSELF OUTSIDE
TIED TO A **MORULA** TREE!

WILL YOU TWO CUT
IT OUT!

DON'T WORRY ABOUT
THESE TWO, KITSO.
THEY NEVER TAKE
A BREAK.

THIS IS REALLY FAST!!!

2000000M!!!



OUR TRAITS ARE DETERMINED BY SPECIAL INSTRUCTION BOOKS IN OUR BODIES, CALLED GENES. WE LOOK DIFFERENT FROM EACH OTHER BECAUSE OUR **GENES** ARE DIFFERENT.

SCIENTISTS CALL OUR PHYSICAL CHARACTERISTICS OUR **PHENOTYPE**.

SOME OF US REMAINED IN THE SAME ENVIRONMENT EXPERIENCING FEW CHANGES.

AS OUR ANCENSTORS MIGRATED, THEY CHANGED TO EXPRESS DIFFERENT PHYSICAL CHARACTERISTICS.

WHILE OTHERS MIGRATED, HAVING TO ADAPT TO DIFFERENT ENVIRONMENTS. SOME BECAME WHAT WE CALL BANTU, MADE UP TODAY OF MANY TRIBES INCLUDING ZULUS, XHOSAS, AND EVEN THE TSWANA, WHICH IS MY TRIBE.

ME TOO!

PLANTS AND ANIMALS ADAPT TO DIFFERENT ENVIRONMENTS TOO, PASSING ON THEIR GENES AND TRAITS TO THEIR CHILDREN, A PROCESS WE CALL **HEREDITY**.

AND THE STUDY OF HEREDITY IS CALLED **GENETICS**. ARE WE TOGETHER?

YES, RRAI

NOW LET'S TRAVEL A FEW HUNDRED YEARS BACK TO WHAT IS NOW THE COUNTRY OF UGANDA TO LEARN ABOUT SOME INTERESTING ANIMALS.



EWWI COW DUNGI

WOW, THOSE CATTLE HAVE VERY LONG HORNS!

THOSE ARE THE ANKOLE CATTLE. THEIR MOST FAMOUS TRAITS ARE THEIR HORNS.

THEY'RE BEAUTIFUL AND LOOK STRONG. I HAVE NEVER SEEN ANYTHING LIKE THEM.

THEIR UNIQUE TRAITS WERE SELECTED BY MY ANCESTORS, BANTU PASTORALISTS, OR CATTLE FARMERS, FOR MANY GENERATIONS.

THE PASTORALISTS BRED THE BEST COWS WITH THE BEST BULLS TO SELECT THE TRAITS THEY WANTED TO ARCHIEVE.

BULLS WERE SELECTED MAINLY BY FOCUSING ON BODY SIZE AND WHITE HORNS THAT ARE LARGE AND CURVED UPWARD. IT IS OUR INDIGENOUS KNOWLEDGE OF SELECTING TRAITS.



BUT WHY DID THEY WANT TO SELECT TRAITS?

WELL, SOME BELIEVE THAT THE ANKOLE CATTLE WERE SELECTIVELY BRED FOR THE BEAUTY OF THEIR HORNS - THOSE WITH THE LARGEST HORNS WERE GIVEN TO THE KING - BUT THE HORNS ALSO SERVE A PURPOSE: TO PROTECT THE CATTLE AND HELP THEM DISPERSE HEAT.

REALLY?

NOW YOU CAN SEE THAT
IT'S NOT ONLY HUMANS
WITH UNIQUE TRAITS,
BUT ANIMALS TOO.

NOW, THAT'S WHY THE
RESEARCHERS AT YOUR CLINIC
WANT YOU TO PARTICIPATE
IN THEIR GENETICS STUDY,
SO THAT THEY CAN LEARN
ABOUT YOUR SPECIAL TRAITS.
IN THE MEANTIME, LET'S LEARN
MORE ABOUT TRAITS, SHALL WE?

SURE!

XT, MAY YOU DO US
THE HONOUR PLEASE?

WITH PLEASURE.

SHOOOOF!!!

WHERE ARE WE?

THE YEAR IS 1856. WE'RE
IN THE GARDEN OF THE
AUGUSTINIAN ABBEY OF ST.
THOMAS, IN THE COUNTRY
NOW KNOWN AS THE CZECH
REPUBLIC.

THAT MAN IS GREGOR MENDEL.
HE WAS A MONK WHO
LIKED TO PLANT PEAS
IN HIS SPARE TIME.

MENDEL CARRIED OUT A SERIES
OF EXPERIMENTS USING PEA
PLANTS WHICH LAID THE
FOUNDATION FOR THE FIELD
OF MODERN GENETICS.

DUMELA, RRE MENDEL!

HE WON'T BE ABLE
TO HEAR OR SEE
YOU. WE'RE INVISIBLE,
REMEMBER.

	HEIGHT	SEED SHAPE	SEED COLOUR	SEED COAT COLOUR	POD SHAPE	POD COLOUR	FLOWER POSITION
DOMINANT							
RECESSIVE TRAIT							
	TALL	ROUND	YELLOW	GREEN	INFLATED (FULL)	GREEN	AXIAL
	SHORT	WRINKLED	GREEN	WHITE	CONSTRUCTED (WRINKLED)	YELLOW	TERMINAL

MENDEL WAS PUZZLED BY THE
WAY SOME TRAITS IN HIS PEA
PLANTS SEEMED MORE COMMON
THAN OTHERS AND WHY SOME
TRAITS SEEMED TO APPEAR OUT
OF NOWHERE.

SOME PEAS WERE YELLOW, SOME
WERE GREEN. SOME PEA FLOWERS
WERE PURPLE, SOME WERE WHITE. SOME
PLANTS WERE TALL, SOME WERE SHORT.

MENDEL BRED THE
PEA PLANTS.

YOU MEAN LIKE THE BANTU
PASTORALISTS BRED THE
CATTLE?

YES, INDEED! PEA PLANTS HAVE BOYS
AND GIRLS TOO! MENDEL TOOK POLLEN
FROM ONE PLANT, DUSTED IT ONTO
ANOTHER, AND THE PEAS PRODUCED
BY THOSE PEA PLANTS WERE THEN
PLANTED TO MAKE PEA PLANT
CHILDREN!

	HEIGHT	SEED SHAPE	SEED COLOUR	SEED COAT COLOUR	POD SHAPE	POD COLOUR	FLOWER POSITION
DOMINANT							
RECESSIVE TRAIT							
	TALL	ROUND	YELLOW	GREEN	INFLATED (FULL)	GREEN	AXIAL
	SHORT	WRINKLED	GREEN	WHITE	CONSTRUCTED (WRINKLED)	YELLOW	TERMINAL

IN ONE EXPERIMENT, HE CROSSED PURPLE-FLOWERED PEA PLANTS WITH WHITE-FLOWERED PEA PLANTS TO SEE WHAT THE OUTCOME WOULD BE. CAN YOU GUESS WHAT THE BABY PEA PLANTS GREW UP TO LOOK LIKE?

ACTUALLY, ALL THE BABY PEA PLANTS TURNED OUT TO HAVE PURPLE FLOWERS.

HMM... I'D SAY A VERY LIGHT PURPLE?

HUH?

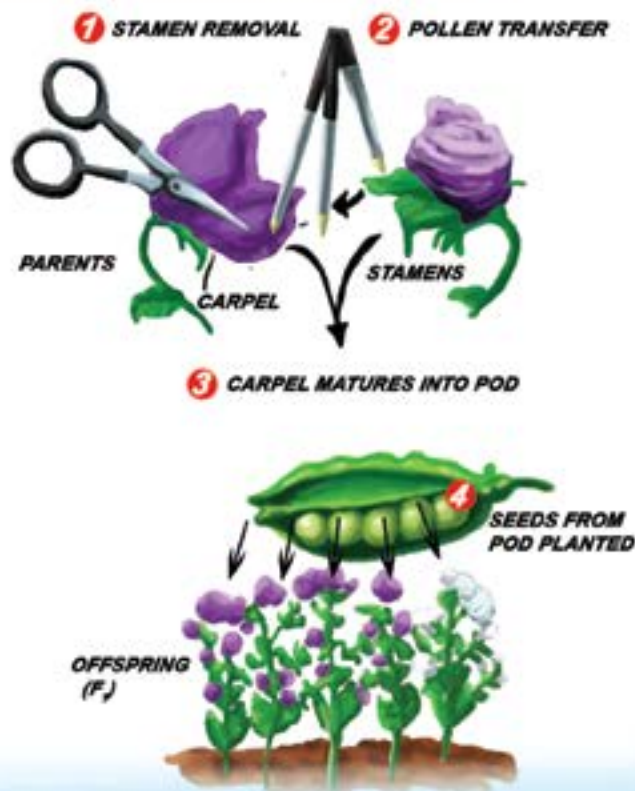


BUT MENDEL WASN'T FINISHED. HE THEN TOOK ONE OF THOSE BABY PEA PLANTS WITH PURPLE FLOWERS AND BRED IT WITH A PURPLE-FLOWERED PEA PLANT.

ALL PURPLE AGAIN, I'M GUESSING?"

ACTUALLY 3 WERE PURPLE AND ONE WAS WHITE.

BUT HOW COULD A WHITE FLOWER COME FROM PARENTS WHO ONLY HAD PURPLE FLOWERS?



MENDEL HAD DISCOVERED SOMETHING CALLED **GENETIC DOMINANCE**. HE REALIZED THAT SOME TRAITS, SUCH AS PURPLENESS OF FLOWERS, WERE DOMINANT—OR STRONGER—THAN THEIR OPPOSITE. IN THIS CASE, WHITE FLOWERS.

WHITENESS REMAINED "ASLEEP" IN THE CHILDREN BUT "AWOKE" IN THE GRANDCHILDREN.

I'M DOCUMENTING THE FAMILY TREE OF THE PEA PLANTS.

XT, WHAT ARE YOU DOING DRAWING ON THAT WALL?

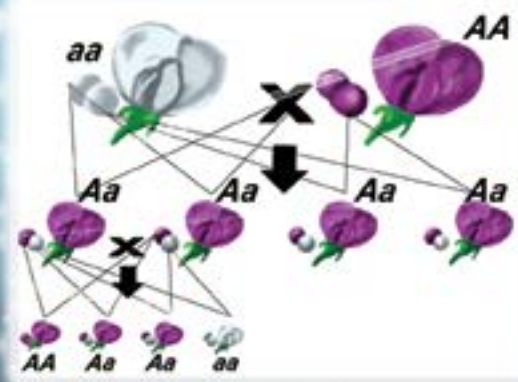
AND THAT IS WHAT SCIENTISTS CALL A **PEDIGREE**.

ENOUGH CAVE DRAWINGS, OLD MAN, CHECK THIS OUT!

WHAT DO ALL THOSE 'A'S REPRESENT?

A PLANT, LIKE OTHER ORGANISMS, HAS TWO COPIES OF EACH GENE, CALLED **ALLELES**. BUT IT CAN ONLY GIVE ONE ALLELE TO EACH CHILD. CAPITAL 'A' IS THE **DOMINANT** ALLELE AND SMALL 'a' IS THE **RECESSIVE** ALLELE.

WHEREVER YOU SEE A CAPITAL 'A', YOU KNOW THE PEA PLANT HAS DECIDED TO PRODUCE PURPLE FLOWERS. THAT LONELY GUY OVER THERE HAS ONLY SMALL 'a's AND THUS HE MANAGED TO ONLY HAVE WHITE FLOWERS.

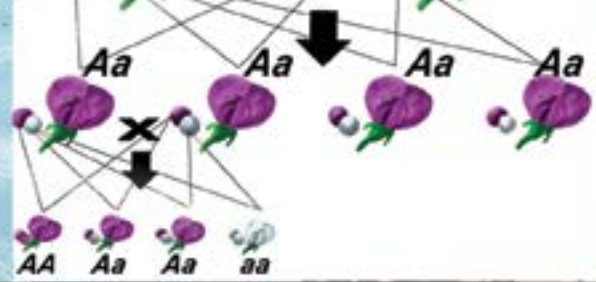


AS YOU CAN SEE, THERE'S A 1 IN 4 CHANCE THAT THOSE TWO PURPLE PARENTS WITH THE HIDDEN WHITE ALLELE WILL PRODUCE A WHITE CHILD. LET ME PULL UP MY **PUNNET SQUARE** APP TO SHOW YOU. SEE? ONLY ONE CHILD GETS BOTH RECESSIVE - SMALL "a" - ALLELES.

HOPE YOU'RE NOT AFRAID OF LEARNING SOME BIG WORDS! WHEN ONE PLANT HOLDS TWO OF THE SAME ALLELE, LIKE AA OR aa, IT'S CALLED **HOMOZYGOUS**. WHEN A PLANT HOLDS TWO DIFFERENT ALLELES, SUCH AS Aa, IT'S CALLED **HETEROZYGOUS**.

THE WAY YOU CAN REMEMBER THIS IS THAT 'HOMO-' MEANS 'SAME' AND 'HETERO' MEANS 'DIFFERENT'. THE LETTERS REPRESENT THE **GENOTYPE** AND THE PURPLE AND WHITE FLOWERS REPRESENT THE **PHENOTYPE**.

	A	a
A	AA	Aa
a	Aa	aa



MENDEL REPEATED THESE EXPERIMENTS OVER AND OVER. HE PLANTED OVER 10,000 PEA PLANTS! HE FOUND THAT TALLNESS WAS **DOMINANT** OVER SHORTNESS, YELLOW PEAS WERE **DOMINANT** OVER GREEN PEAS, SMOOTH PEAS WERE **DOMINANT** OVER WRINKLED PEAS AND SO ON...

BUT I DON'T GET IT. WHERE DOES THE **RECESSIVE** ALLELE HIDE? HOW DOES SHORTNESS HIDE IN A TALL PLANT AND WHITENESS HIDE IN A PURPLE FLOWER?

MENDEL ASKED HIMSELF THE SAME QUESTION. HE WAS NEVER ABLE TO FULLY ANSWER THAT QUESTION, BUT HE EVENTUALLY CONCLUDED THAT SOMEWHERE DEEP INSIDE THESE PEA PLANTS, THERE LIES A SECRET CODE.

WHOAI A SECRET CODE? I WISH I HAD A SECRET CODE.

SEED COLOUR	SEED SHAPE	STEM LENGTH
YELLOW	ROUND	TALL
GREEN	WRINKLED	SHORT
YELLOW	ROUND	TALL

YOU DO! IN FACT, EVERY LIVING THING HAS A CODE.

FOR EXAMPLE, YOU MAY NOT HAVE EVER KNOWN YOUR GREAT-GRANDFATHER, KITSO, BUT YOU DEFINITELY HAVE HIS CHIN. IT'S LIKE YOU CARRY A LITTLE PIECE OF HIM WITH YOU WHEREVER YOU GO!

HE'S RIGHT! YOUR ANCESTORS ARE ALIVE AND WELL TUCKED AWAY INSIDE YOUR SECRET CODE.

HOW DID YOU KNOW? THAT'S WHAT MY AUNTY ALWAYS SAYS!

HOW CAN I GET MY HANDS ON MY SECRET CODE?

I THOUGHT YOU'D NEVER ASK. HOLD ON!

WHOOOOAAAAHHH!!!

YOU WANNA TELL ME WHERE WE ARE?

WE'RE IN THE CAVENDISH LABORATORY IN CAMBRIDGE, ENGLAND. THE YEAR IS 1952. THOSE TWO DUDES OVER THERE ARE JAMES WATSON AND FRANCIS CRICK. THEY'RE ABOUT TO CRACK LIFE'S SECRET CODE.

WHOA! WHO IS THAT WOMAN AND WHAT IS SHE HOLDING IN HER HANDS? IS THAT THE KEY TO THE SECRET CODE?!

WHO IS THE MYSTERIOUS WOMAN? WHAT IS SHE HOLDING? WILL WATSON AND CRICK **CRACK THE CODE**? WILL KITSO GET STUCK IN THE PAST? STAY TUNED FOR **PART TWO** OF THE **GENOME ADVENTURES** COMIC BOOK SERIES TO FIND OUT!

GLOSSARY

SCIENTIFIC TERMS

ALLELE – ONE OF TWO COPIES OF EACH GENE. INDIVIDUALS USUALLY HAVE TWO ALLELES FOR EACH TRAIT OR CHARACTERISTIC, ONE FROM EACH PARENT.

CD4 COUNT – A LAB TEST THAT MEASURES THE NUMBER OF CD4 CELLS, A CERTAIN TYPE OF WHITE BLOOD CELL THAT HELPS FIGHT INFECTIONS, IN A SAMPLE OF YOUR BLOOD. IT IS A WAY TO DETERMINE HOW WELL YOUR IMMUNE SYSTEM IS WORKING.

DOMINANT – THE ALLELE/GENE COPY MOST LIKELY TO PRODUCE A TRAIT IN OFFSPRING; AN ALLELE THAT SHOWS ITS EFFECT EVEN IF AN INDIVIDUAL ONLY HAS ONE COPY OF THE ALLELE. FOR EXAMPLE, THE ALLELE FOR BROWN EYES IS DOMINANT, SO AN INDIVIDUAL ONLY NEEDS ONE COPY OF THE 'BROWN EYE' ALLELE TO HAVE BROWN EYES.

GENE – A PART OF EVERY CELL THAT CARRIES THE INFORMATION THAT DETERMINES THE FEATURES OR CHARACTERISTICS THAT ARE INHERITED FROM YOUR PARENTS.

GENETIC DOMINANCE – WHEN A CERTAIN TRAIT IS MORE DOMINANT, OR STRONGER, THAN ITS OPPOSITE.

GENETICS – THE STUDY OF GENES AND HEREDITY.

GENOTYPE – THE ENTIRE SET OF GENES IN AN ORGANISM; THE GENES - OR SET OF ALLELES - THAT PRODUCE A CERTAIN CHARACTERISTIC OR TRAIT (PHENOTYPE) IN AN INDIVIDUAL.

HEREDITY – THE PROCESS OF PASSING TRAITS AND GENETIC CHARACTERISTICS FROM PARENTS TO THEIR OFFSPRING.

HETEROZYGOUS – TWO DIFFERENT FORMS OF A GENE—THE ONE FROM THE 'MOTHER' AND THE OTHER FROM THE 'FATHER' ARE DIFFERENT; WHEN AN ORGANISM HAS TWO DIFFERENT ALLELES/COPIES OF A GENE.

HIV – A TYPE OF VIRUS THAT INFECTS AND DESTROYS THE BODY'S IMMUNE SYSTEM.

HOMOZYGOUS – TWO OF THE SAME FORM OF A GENE – THE ONE FROM 'MOTHER' AND THE OTHER FROM THE 'FATHER' ARE THE SAME; WHEN AN ORGANISM HAS TWO OF THE SAME ALLELES/COPIES OF A GENE.

PEDIGREE – A LIST OF ANCESTORS; A FAMILY TREE; AN ILLUSTRATION OF THE INHERITANCE OF A SPECIFIC TRAIT OR DISEASE THROUGH SEVERAL GENERATIONS.

PHENOTYPE – THE CHARACTERISTICS OF AN INDIVIDUAL THAT YOU CAN SEE E.G. EYE COLOUR, HAIR COLOUR.

PUNNET SQUARE – A DIAGRAM THAT IS USED TO PREDICT AN OUTCOME OF A PARTICULAR BREEDING EXPERIMENT, USED BY BIOLOGISTS TO DETERMINE THE PROBABILITY OF AN OFFSPRING HAVING A PARTICULAR GENOTYPE.

RECESSIVE – THE ALLELE/GENE COPY MOST LIKELY TO STAY HIDDEN IN OFFSPRING; AN ALLELE THAT ONLY SHOWS ITS EFFECT WHEN AN INDIVIDUAL HAS TWO COPIES OF THE ALLELE. FOR EXAMPLE, THE ALLELE FOR BLUE EYES IS RECESSIVE SO IF AN INDIVIDUAL HAS BLUE EYES, THEY HAVE TWO COPIES OF THE 'BLUE EYE' ALLELE.

TRAITS – SPECIFIC PHYSICAL CHARACTERISTICS OF ORGANISMS THAT MAKE US UNIQUE SUCH AS EYE COLOUR OR BODY SIZE. WE INHERIT TRAITS FROM OUR PARENTS.

TUBERCULOSIS (TB) – AN INFECTIOUS BACTERIAL DISEASE THAT CAN AFFECT ALMOST ANY TISSUE IN THE BODY, ESPECIALLY THE LUNGS.

VIRAL LOAD – A MEASURE OF THE NUMBER OF VIRAL PARTICLES PRESENT IN AN ORGANISM. ESPECIALLY THE NUMBER OF HIV VIRUSES IN THE BLOODSTREAM.

SETSWANA TERMS

DUMELA – GREETINGS; HELLO; PLURAL – DUMELANG.

KGALAGADI – SETSWANA TERM FOR THE KALAHARI DESERT

MMA/MME – MADAM; MOTHER.

MORULA – A COMMON TREE IN BOTSWANA AND SOUTHERN AFRICA WITH EDIBLE FRUITS.

MOSIMANE – A YOUNG BOY.

RA/RR – SIR; FATHER.

THOBANE – A TRADITIONAL WALKING STICK.

EISHI – AN EXCLAMATION EXPRESSIVE OF SURPRISE, FRUSTRATION, DISAPPROVAL, ETC.

BLAST TO THE PAST: KITSO EXPLORES GENETICS AND HEREDITY

VERSION 1.0, FIRST PUBLISHED 2015, GABORONE, BOTSWANA

COPYRIGHT © BOTSWANA-BAYLOR CHILDREN'S CLINICAL CENTRE OF EXCELLENCE 2015

ACKNOWLEDGEMENTS

THIS COMIC BOOK IS THE PRODUCT OF THE COLLABORATIVE EFFORTS BY THE FOLLOWING:

PROJECT CREATION AND DESIGN: ABRAHAM MAMELA, ALBERT LEKGABA, EDWARD PETTITT

SCRIPT WRITERS: TIDIMALO DENNIS, TIERRA HOLMES, DANIEL KOEHLER, NATASHA MORAKA, AAMIRAH MUSSA, JONATHAN STRYSKO, TSWELELOPELE MASUTLHA

MEDICAL/SCIENTIFIC ADVISORS: MASEGO TSIMAKO-JOHNSTONE, SEBALD VERKUIJL

PROJECT ASSISTANTS: THATO REGONAMANYE, TAPIWA KANGWA, ZACK BONZELL, OMPHILE MORAGI, LEMOGANG MOSIE

YOUTH CONTRIBUTORS: ANNAH KETLAARENG, KETELELO MOAPARE

CAFGEN COMMUNITY ADVISORY BOARD: KESEGO BASHA-MUPELI (CEYOHO); SHEIK H. HASSAN (BOTSWANA MUSLIM ASSOCIATION); CINDY KELEMI (BONELA); NONTOMBI KRAAI (INTERNATIONAL LINKS); IRENE KWAPPE (BOCAIP); PHENYO MAHUMA (BCC); ALICE MOGWE (DITSHWANELO); KGORELETSO MOLOSIWA (BONEPWA+); ONKEMETSE MONTSHEKI (CHILDLINE BOTSWANA); JOB MORRIS (SAN YOUTH NETWORK); KAGO MOTEKETELA (YOUTH MEMBER); BUYANI ZONGWANI (MISA)

STRATEGIC GUIDANCE WAS PROVIDED BY THE BOTSWANA CAFGEN TEAM: GABRIEL ANABWANI, S.W. MPOLOKA, MOGOMOTSI MATSHABA, OLEKANTSE MOLATLHEGI, KEOFENTSE MATHUBA, MADUKE KULA, ABHILASH SATHYAMOORTHY, LEANO PHETOGO, CLINS MMUNYANE, NICHOLAS MURIITHI, KENNEDY SICHONE, KOKETSO MAPLANKA, PINKIE GOBUAMANG, AND LETOYA CYNTHIA BALEBETSE

DISCLAIMER

WHILE WE HAVE MADE REASONABLE EFFORTS TO VERIFY THE SCIENTIFIC ACCURACY OF THE CONTENTS OF THIS BOOK, THE INFORMATION CONTAINED HEREIN IS NOT MEANT TO SERVE AS MEDICAL ADVICE. TO THE EXTENT PERMITTED BY LAW, THE AUTHORS AND PUBLISHERS OF THIS BOOK AND THEIR AGENTS ACCEPT NO LIABILITY FOR ANY INJURY, LOSS, OR DAMAGE CAUSED BY RELIANCE ON ANY OF THIS INFORMATION.

ALL RIGHTS RESERVED





NO PART OF THIS PUBLICATION MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC, MECHANICAL, PHOTOCOPYING, RECORDING, OR OTHERWISE, WITHOUT THE PRIOR WRITTEN PERMISSION OF THE BOTSWANA-BAYLOR CHILDREN'S CLINICAL CENTRE OF EXCELLENCE, PLOT 1836, HOSPITAL WAY, PRINCESS MARINA HOSPITAL, PRIVATE BAG BR129, GABORONE, BOTSWANA.



GENOME ADVENTURES

GENOME ADVENTURES IS AN INNOVATIVE WELLCOME TRUST-FUNDED COMMUNITY ENGAGEMENT INITIATIVE OF THE COLLABORATIVE AFRICAN GENOMICS NETWORK (CAFGEN). CAFGEN IS A MEMBER OF THE HUMAN HEREDITY AND HEALTH IN AFRICA CONSORTIUM (H3AFRICA) AND IS COORDINATED BY THE BOTSWANA-BAYLOR CHILDREN'S CLINICAL CENTRE OF EXCELLENCE (COE). GENOME ADVENTURES UTILIZES CAPACITY BUILDING WORKSHOPS, EDUCATIONAL COMICS, AND SOCIAL MEDIA TO ENGAGE COMMUNITY STAKEHOLDERS, MEDIA PRACTITIONERS, AND THE GENERAL PUBLIC - ESPECIALLY THE YOUTH - IN GENOMICS AND BIOMEDICAL RESEARCH. OUR GENOME ADVENTURES COMIC BOOK SERIES AIMS TO EDUCATE READERS ON THE HISTORY OF HEREDITY AND GENETICS, THE STRUCTURE AND FUNCTION OF DNA AND GENES, THE LINK BETWEEN GENOMICS AND HEALTH, AND THE PROCESS FOR ENROLLING IN A BIOMEDICAL OR GENOMICS RESEARCH STUDY, INCLUDING ETHICAL ISSUES PERTAINING TO INFORMED CONSENT, SAMPLE SHIPPING AND STORAGE, AND COMMUNITY ENGAGEMENT.

FOR MORE INFORMATION OR TO FOLLOW OUR UPDATES, PLEASE VISIT OUR SOCIAL MEDIA:

-  GENOMEADVENTURES.WEEBLY.COM
-  FACEBOOK.COM/GENOMEADVENTURES
-  TWITTER.COM/GENOMEADVENTURE
-  PINTEREST.COM/GENOMEADVENTURE

Supported by

wellcometrust

and NIH

distributed by

The Botswana
GAZETTE
"Kiriso ke maatla"