



# HELMINTHS

THE SECRET WORLD OF PARASITIC WORMS



wellcome  
centre  
integrative  
parasitology



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PUBLISHED BY WELLCOME CENTRE FOR INTEGRATIVE PARASITOLOGY, SIR GRAEME DAVIES BUILDING, UNIVERSITY OF GLASGOW, 120 UNIVERSITY PLACE, GLASGOW G12 8TA.

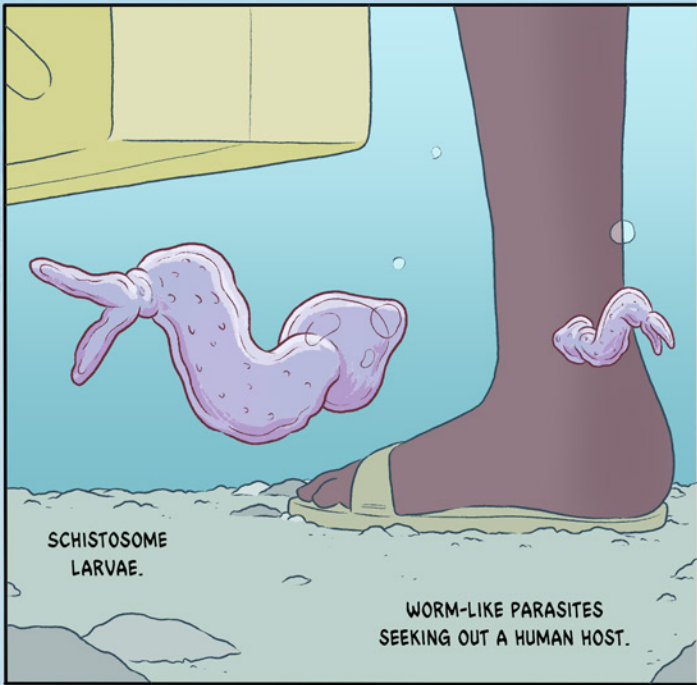
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ANOTHER BEAUTIFUL DAY IN UGANDA,  
ON THE SHORES OF LAKE VICTORIA.





BUT SOMETHING LURKS UNDER THE WATER.



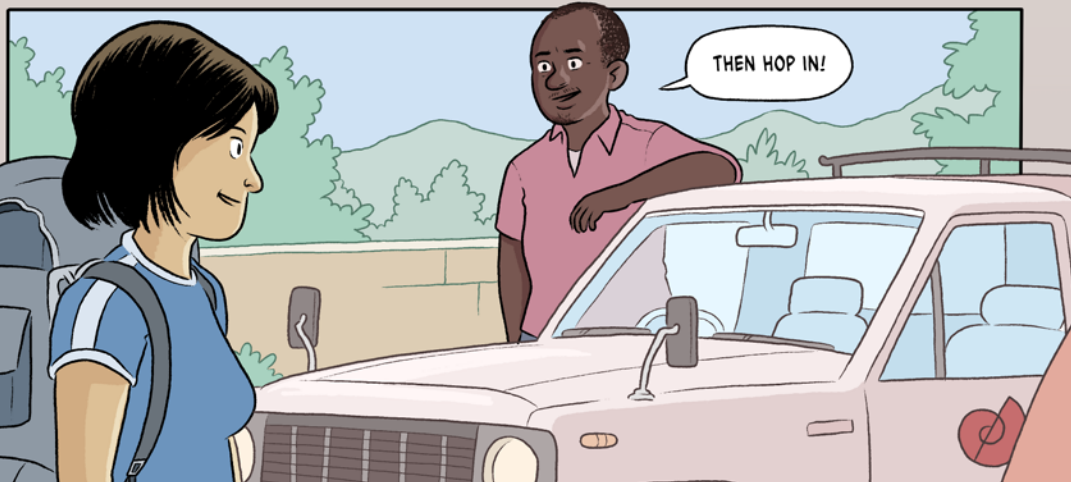
SCHISTOSOME LARVAE.


WORM-LIKE PARASITES SEEKING OUT A HUMAN HOST.



AND JUST LIKE THAT


SHE'S INFECTED.





WE'VE ARRIVED JUST IN TIME! TODAY WE'RE TREATING THE ENTIRE VILLAGE FOR SCHISTOSOMIASIS.

WHAT A VIEW!



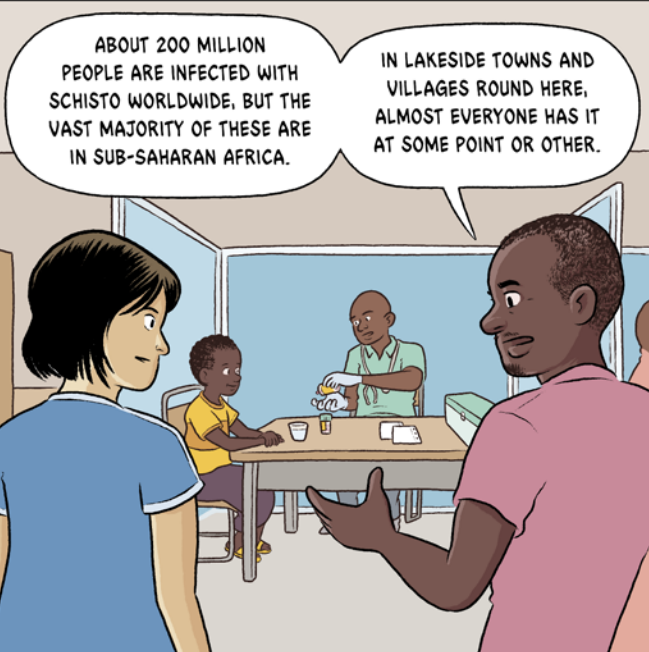
IT'S LOVELY HERE, BUT THIS DISEASE IS A BIG PROBLEM.

IT'S CAUSED BY A PARASITIC WORM WHICH GROWS IN WATER SNAILS BEFORE BURSTING OUT AND INFECTING HUMANS.




BACK IN SCOTLAND WE ONLY THINK ABOUT SNAILS WHEN THEY BURST OUT AND INFECTING HUMANS.

YOU'RE LUCKY, THE SNAILS HERE SPREAD DISEASES AND CAN MAKE PEOPLE REALLY ILL.



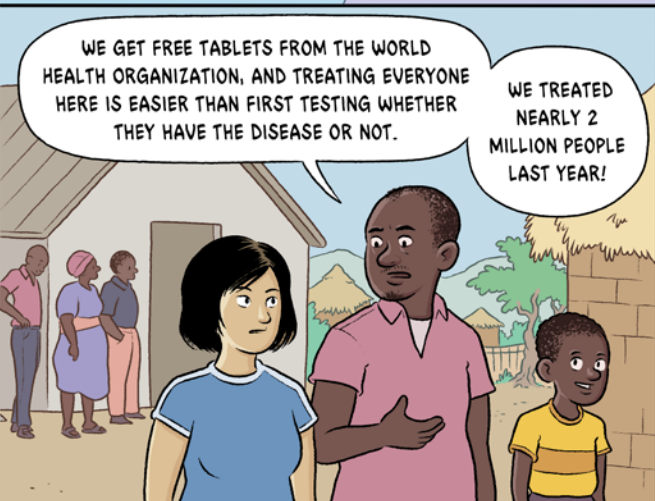
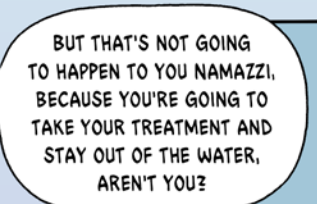
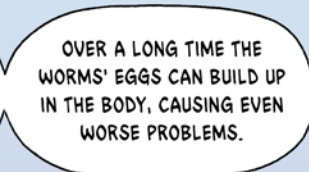
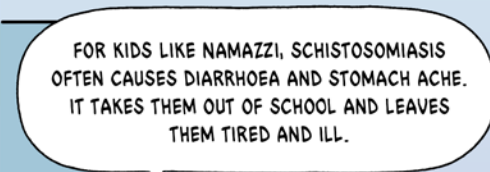
ABOUT 200 MILLION PEOPLE ARE INFECTED WITH SCHISTO WORLDWIDE, BUT THE VAST MAJORITY OF THESE ARE IN SUB-SAHARAN AFRICA.

IN LAKESIDE TOWNS AND VILLAGES ROUND HERE, ALMOST EVERYONE HAS IT AT SOME POINT OR OTHER.



THIS IS NAMAZZI. NO MATTER WHAT I TELL HER SHE KEEPS SWIMMING IN THE LAKE.

ALL THE OTHER KIDS DO IT! HOW ELSE AM I MEANT TO COOL OFF IN THE HEAT?



NAMAZZI, THIS IS POPPY. SHE'S HEADING A TEAM FROM THE WELCOME CENTRE FOR INTEGRATIVE PARASITOLOGY WHO ARE THINKING OF NEW WAYS TO BREAK THIS CYCLE OF INFECTION.

HI!

I'M GLAD YOU BUMPED INTO ME. HERE! A FULL COLLECTION OF POOP SAMPLES TO PROCESS!

OH MAN.

POOP SAMPLES?!

SCHISTOSOME EGGS COME OUT IN OUR POOP. THIS IS HOW PARASITES GET BACK IN THE WATER AND INTO SNAILS.

BY LOOKING FOR PARASITE EGGS IN PEOPLE'S POOP, WE CAN TELL WHO IS INFECTED, AND ALSO EXAMINE THE GENES OF THESE HIDDEN CREATURES!

WHAT HAVE I SIGNED UP FOR?

LET'S GET SIEVING!

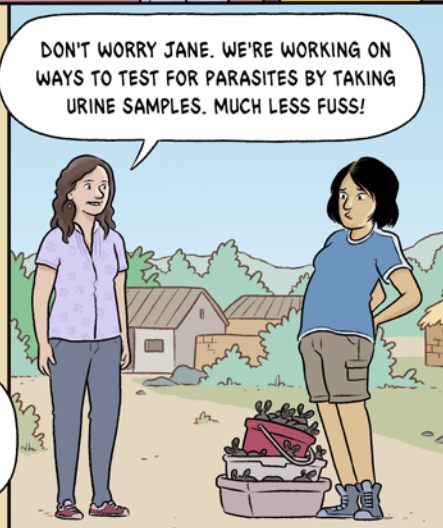
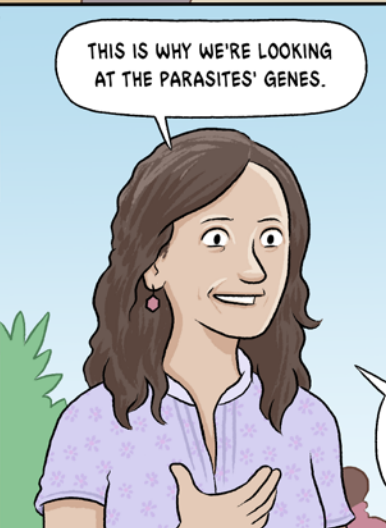
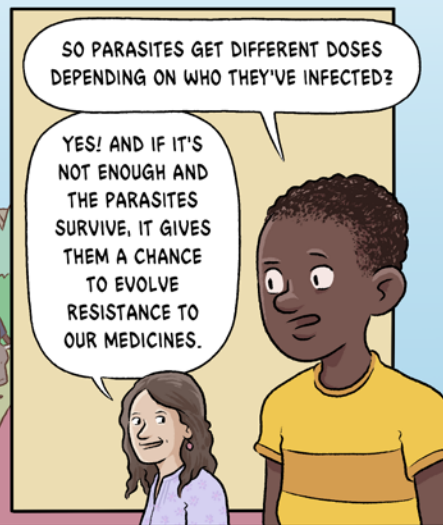
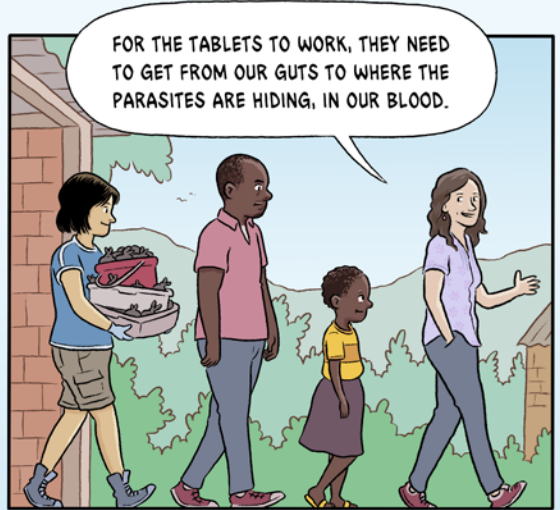
WITH THESE GENETIC PORTRAITS WE GET CLUES TO HOW SCHISTOSOMES WORK, AND CAN SEE HOW SCHISTOSOMES ARE RELATED TO EACH OTHER. WE CAN LEARN A LOT FROM THIS.


I SURE HOPE SO!

SCHISTOSOMES












EVEN IF WE COULD DETECT AND TREAT ALL THESE INFECTIONS, THE LAKES ARE STILL FULL OF SNAILS, AND THE SNAILS ARE FULL OF PARASITES.



MANY PEOPLE SPEND HOURS IN THE WATER WASHING CLOTHES OR FISHING, INCREASING THEIR CHANCES OF INFECTION.

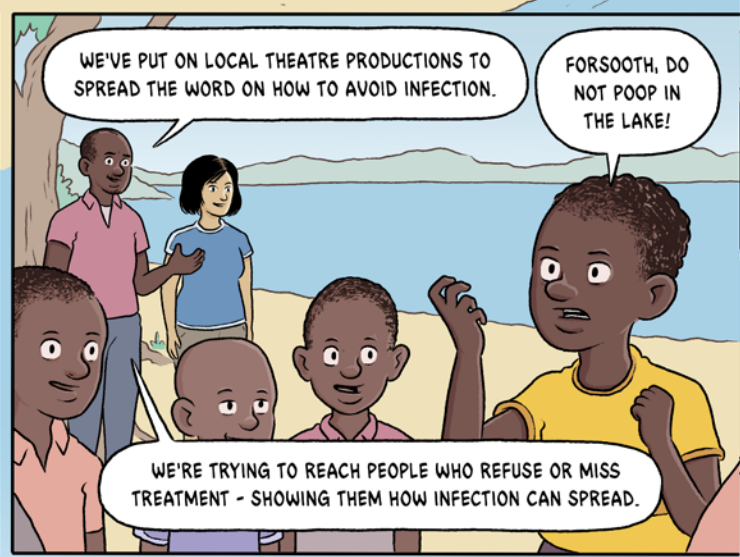


AND SOMETIMES TOILET WASTE RUNS STRAIGHT INTO THE LAKE. THIS IS HOW THE PARASITES GET FROM HUMANS BACK INTO SNAILS TO START THE CYCLE OVER AGAIN.



SO, WE'VE HAD TO GET CREATIVE. WE DON'T JUST RECRUIT BIOLOGISTS TO THE FIGHT, BUT ECONOMISTS, SOCIAL SCIENTISTS AND EVEN ACTORS.


ACTORS?!




WE'VE PUT ON LOCAL THEATRE PRODUCTIONS TO SPREAD THE WORD ON HOW TO AVOID INFECTION.

FORSOOTH, DO NOT POOP IN THE LAKE!

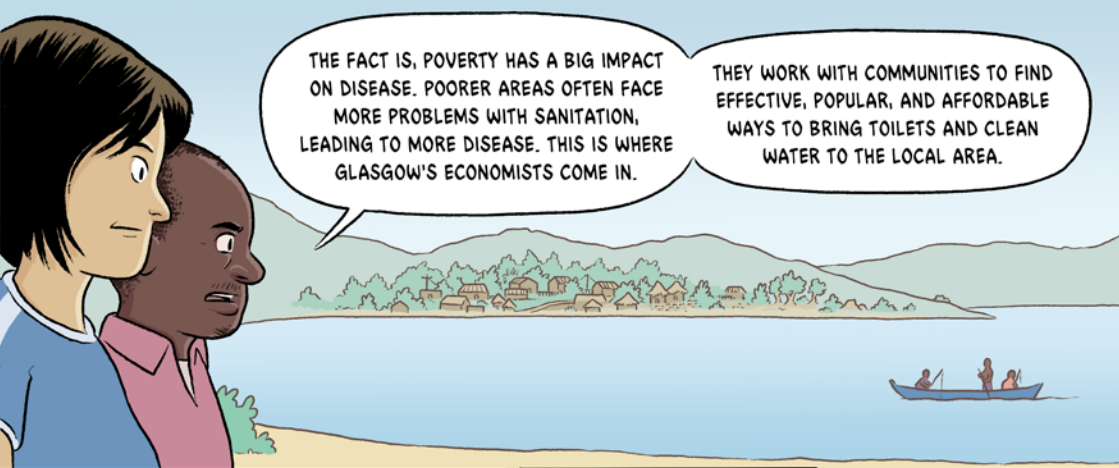
WE'RE TRYING TO REACH PEOPLE WHO REFUSE OR MISS TREATMENT - SHOWING THEM HOW INFECTION CAN SPREAD.



SOCIAL SCIENTISTS HELP US UNDERSTAND THE CHOICES PEOPLE MAKE. FOR EXAMPLE, PEOPLE RELY ON THIS WATER FOR THEIR EVERYDAY NEEDS.



HERE WE'VE STOPPED PEOPLE FROM STANDING IN THE WATER TO WASH CLOTHES. NOW THEY TAKE WATER AWAY FROM THE LAKE, MEANING THEY'RE LESS EXPOSED.



THE FACT IS, POVERTY HAS A BIG IMPACT ON DISEASE. POORER AREAS OFTEN FACE MORE PROBLEMS WITH SANITATION, LEADING TO MORE DISEASE. THIS IS WHERE GLASGOW'S ECONOMISTS COME IN.

THEY WORK WITH COMMUNITIES TO FIND EFFECTIVE, POPULAR, AND AFFORDABLE WAYS TO BRING TOILETS AND CLEAN WATER TO THE LOCAL AREA.



BY FINDING SUSTAINABLE WAYS TO IMPROVE SANITATION, WE CAN KEEP HUMAN WASTE OUT OF THE LAKE, AND HELP BREAK THE CYCLE OF INFECTION.



GREAT FOR US SWIMMERS!

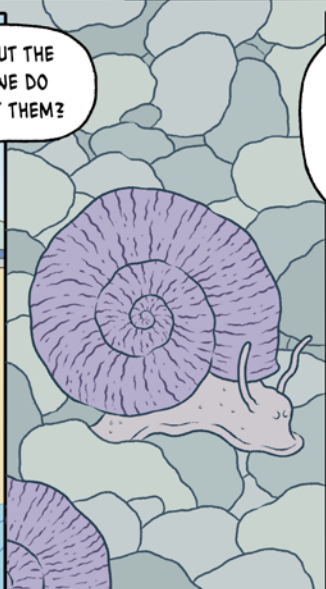


UM, FORMER SWIMMERS!



AND WHAT ABOUT THE SNAILS? CAN WE DO ANYTHING ABOUT THEM?

I SUPPOSE THROWING THEM INTO YOUR NEIGHBOUR'S GARDEN WOULDN'T DO ANY GOOD?



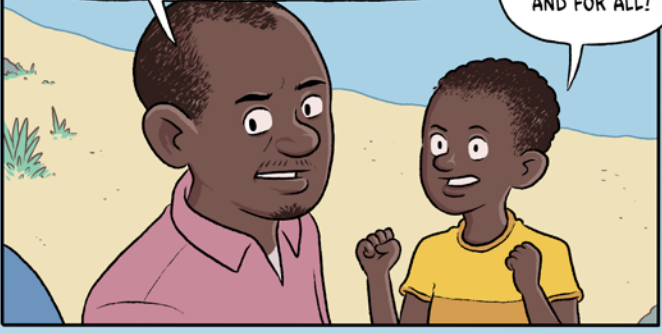
SOMETIMES WE TREAT AREAS WITH CHEMICALS TO KILL THE SNAILS, BUT WE CAN NEVER KILL THEM ALL, AND THERE CAN BE BIG IMPACTS FOR THE LOCAL ECOSYSTEM.

I THOUGHT THAT ALL YOU NEEDED TO STOP A DISEASE WAS A GOOD MEDICINE, BUT IT'S SO MUCH MORE COMPLICATED THAN THAT...



IF WE CAN COMBINE MORE EFFECTIVE TREATMENTS WITH CHANGING BEHAVIOURS AND BETTER SANITATION TO BREAK THE CYCLE, WE'LL CHANGE PEOPLE'S LIVES FOR THE BETTER.

AND KILL OFF THESE NASTY PARASITES ONCE AND FOR ALL!



KILL THEM OFF? DON'T BE SO HASTY!



NAMAZZI, THIS IS RICK. WORM-WRANGLER EXTRAORDINAIRE.



IT'S TRUE, PARASITIC WORMS ARE A NIGHTMARE. BUT THEY'VE BEEN WITH US SINCE THE BEGINNING OF HUMAN HISTORY...



DURING THAT TIME THEY'VE EVOLVED SOME AMAZING WAYS TO SURVIVE IN OUR BODIES.

THERE ARE MANY DIFFERENT KINDS OF PARASITIC WORM. MOST HAVE SOME WAY OF TRICKING THE IMMUNE SYSTEM - THE FORCE THAT PATROLS OUR BODIES LOOKING OUT FOR INVADERS.



SO WHAT?



SO MAYBE PARASITES CAN TEACH US A THING OR TWO.

MANY DISEASES, LIKE ASTHMA, ALLERGIES, AND SOME KINDS OF ARTHRITIS ARE CAUSED WHEN OUR IMMUNE SYSTEM MAKES A MISTAKE - TARGETING SOMETHING HARMLESS LIKE DUST, POLLEN OR EVEN OUR OWN BODIES.



GETTING INFECTED BY SOME PARASITIC WORMS MAY HELP STOP THESE IMMUNE DISEASES. IN FACT, THERE ARE EVEN TRIALS WHERE PATIENTS ARE GETTING A DOSE OF WORMS TO HELP WITH THEIR ILLNESSES.

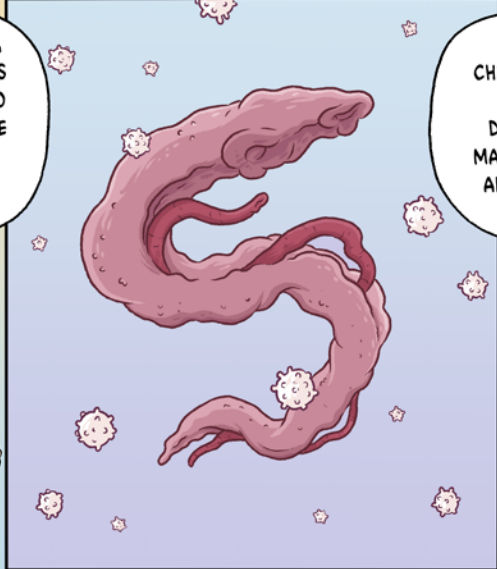


EW.

WELL, YES. EVEN IF IT HELPS, HAVING A WORM INFECTION IS NO FUN! SO, WE'RE TRYING TO PINPOINT EXACTLY HOW THESE PUPPETMASTER WORMS MANIPULATE OUR IMMUNITY TO SURVIVE.



SOME WORMS SPIT OUT CHEMICALS THAT MIMIC PARTS OF THE IMMUNE SYSTEM, DIALLING DOWN DEFENCES. MAYBE THESE MOLECULES CAN ALSO RESTRAIN OVERACTIVE IMMUNE RESPONSES.



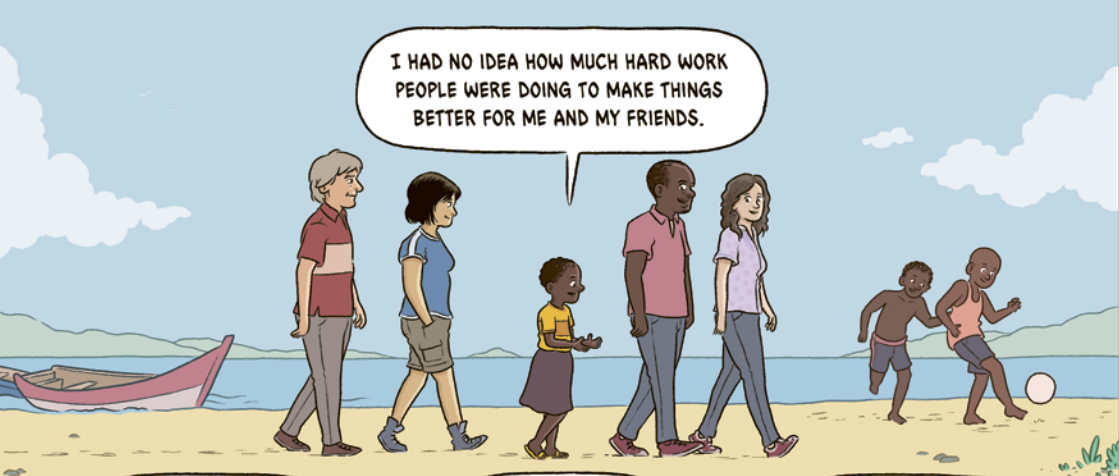
THEY IMITATE OUR IMMUNE SYSTEMS, AND NOW YOU WANT TO IMITATE THEM?

EXACTLY!


HMM, INSPIRED BY THE WORMS! SOUNDS LIKE A JOKE!

EVOLUTION IS A MASTERFUL PROBLEM SOLVER, AND THE TOOLS TO DEFEAT DISEASES SOMETIMES COME FROM THE STRANGEST PLACES.







I HAD NO IDEA HOW MUCH HARD WORK  
PEOPLE WERE DOING TO MAKE THINGS  
BETTER FOR ME AND MY FRIENDS.




PARASITIC WORMS MAKE  
PEOPLE MISERABLE, TAKE  
THEM AWAY FROM WORK AND  
SCHOOL, AND CAN HAVE LONG  
TERM CONSEQUENCES  
FOR HEALTH.




THE HOPE IS THAT ONE  
DAY WE'LL HAVE THESE  
DISEASES UNDER  
CONTROL...



AND ALONG THE WAY MAYBE  
WE CAN BENEFIT FROM SOME  
OF THE SECRETS THESE  
PARASITES HOLD.



MAKING IT SAFER FOR ME  
TO SWIM AND MY DAD  
TO GO FISHING!



ONE DAY. IN THE MEANTIME, JUST REMEMBER YOU'VE GOT PEOPLE  
LIKE MOSES, POPPY AND RICK, FROM KAMPALA TO GLASGOW,  
WORKING HARD TO FIGURE OUT HOW WE GET THERE...



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**THE WELLCOME CENTRE FOR INTEGRATIVE PARASITOLOGY  
IS BASED AT THE UNIVERSITY OF GLASGOW. OUR MISSION IS  
TO DEVELOP A DEEPER UNDERSTANDING OF PARASITES  
IN ORDER TO DEVELOP NEW TREATMENTS.**

**FOR MORE INFORMATION ABOUT OUR WORK PLEASE VISIT:  
[GLA.AC.UK/RESEARCHINSTITUTES/III/WCIP/](http://GLA.AC.UK/RESEARCHINSTITUTES/III/WCIP/)**

**OR CHAT WITH US @WCIPGLASGOW ON TWITTER.**

**WITH THANKS TO DR. POPPY LAMBERTON, DR. RICK MAIZELS, DR. VICKIE CURTIS  
AND ALL OF OUR PROOFREADERS FOR THEIR HELP IN MAKING THIS BOOKLET.**

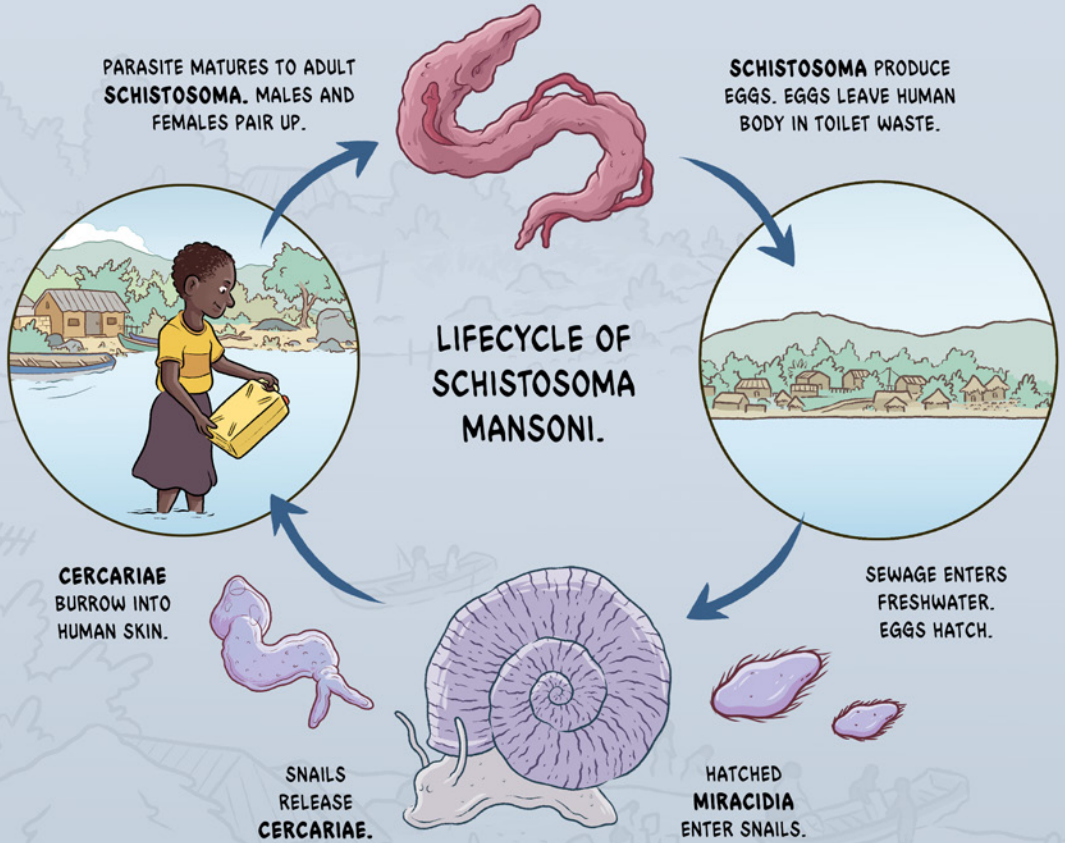
**MORE ABOUT THE CREATORS AT:**

**[WWW.EDWARDROSS.CO.UK](http://WWW.EDWARDROSS.CO.UK)**

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JOIN GLASGOW'S SCIENTISTS AS THEY TRAVEL TO UGANDA TO INVESTIGATE THE SECRETS OF **HELMINTHS**, PARASITIC WORMS THAT CAUSE DISEASE AND ILLNESS AROUND THE WORLD.

PART OF AN AWARD-WINNING SERIES ABOUT PARASITES!



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