

# Huk niraq puriykuna

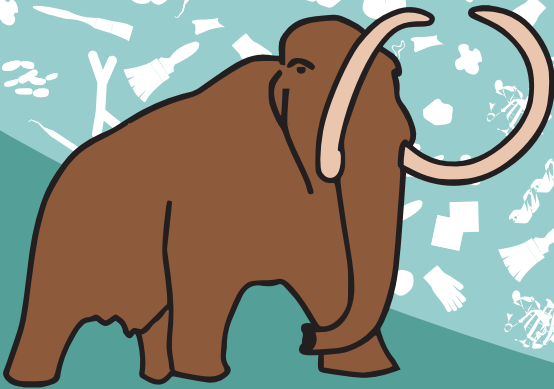
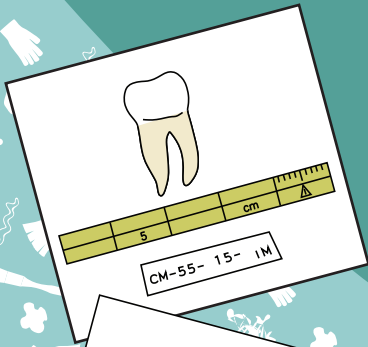
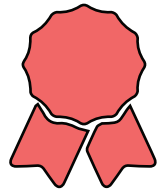


# CIENCIA ARQUEOLÓGICA NISQAPI

Kay maytuqa:

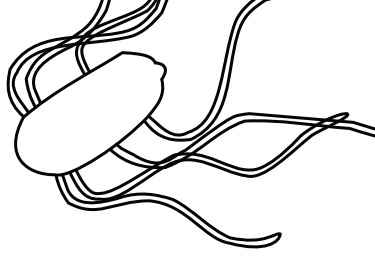
Suti

Qallariq bioarqueologa  
periodo de  
entrenamiento nisqapi



Maytu Ilimpinapaq  
Yachay Wasi Max Planck de  
Ciencias de la Historia Humana





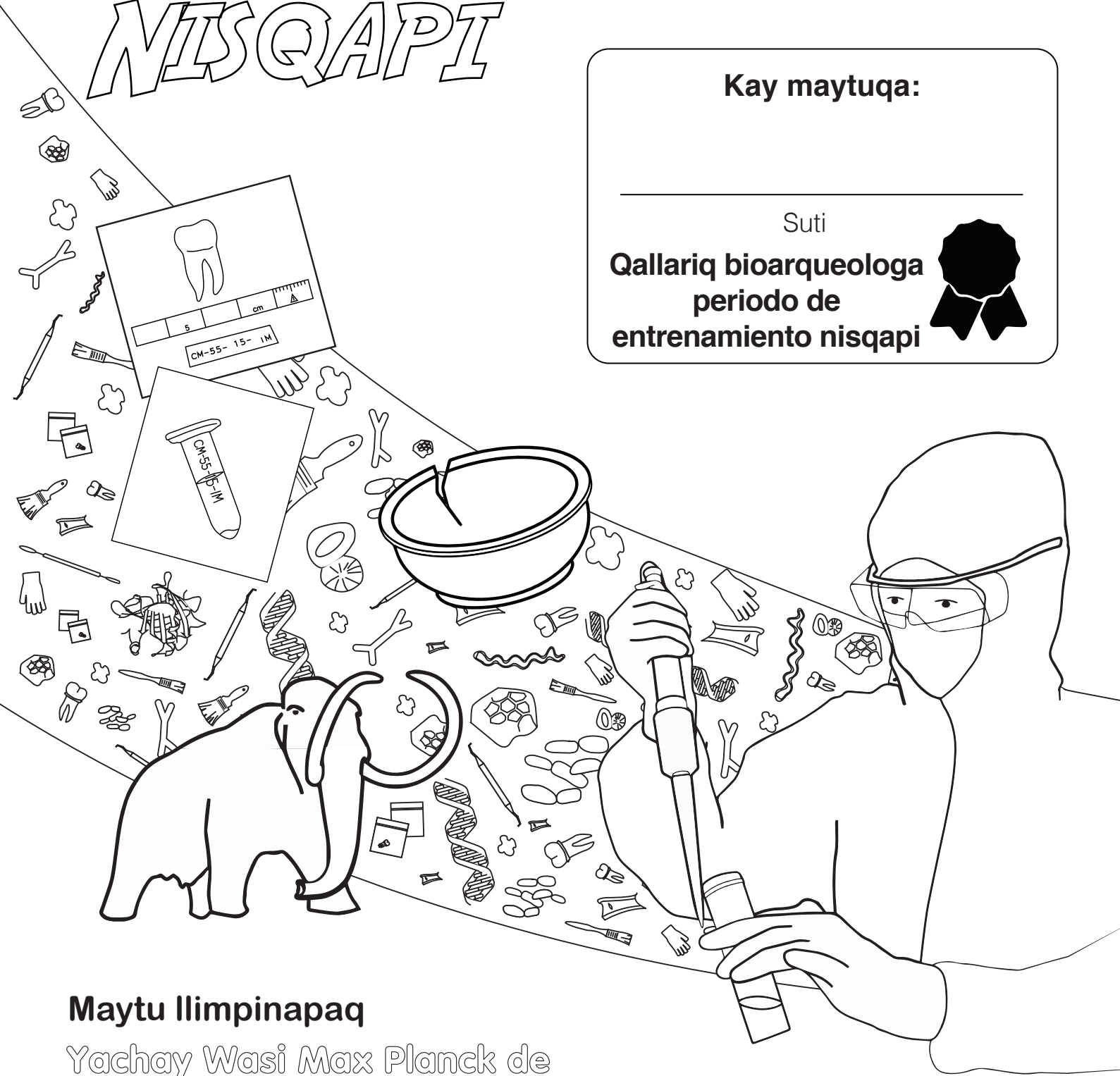
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# CIENCIA ARQUEOLÓGICA NISQAPI

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**Qallariq bioarqueologa  
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# PIKUNATAQ KANCHIK

Bioarqueologokunaqa maskaqmi kaniku chaymi runakunapa ñawpaq kawsayninkumanta imayna kasqankumanta mana yachakuq yachaykunata istudyankupaq método científico nisqakunawan huk niraq musuq ruraykunawanpas llamkaniku.



Palitin sutiyuq  
llamkana

## Pampapi...

Bioarqueologokunaqa arqueologokunawanmi huñulla pampata aspinku muestrakunata huñunankupaq hinaspa chaykunata chaymantaña laboratorio wasipi istudyankupaq. Kay llamkaypiqa wañuqkunapa pampayninkumantapas maskana, ñawpa churanakunapa puchunkunatapas huñuna, uywakunapa tullunkunatapas qupa churanakunapi maskana (uchkukuna qupakunawan) utaq tukuy imakunapa ukunpi kasqanta puchusqantapas allinta rakina yurakunapa, qurakunapa, imankunata tarinapaq.

## Laboratorio wasipi...

Ñawpa ADNta hapitiyku, hatunyachaqa kaptiyku llimpu, pichasqa, salakunapi llamkanayku kachkan hinallataq llimpu ispisyal pachakunawan churakunayku kachkan, maki churanawanpas butaswanpas ñawpaq muestrakunata harkanapaq musuq qipa ADNmanta, manam kaykunawan taqrukunanpaq.

Hatunyachaqkunaqa tukuy niraq istrumintukunawan llamkanku ñawpa muestrakunata qawanankupaq, istudyankupaq.



Pipita sutiyuq  
llamkana



# ASPINAPAQ

Bioarqueologokunaqa tiqsimuyunta illanku ñawpa ruanakunapa kawsayninkumanta willakuykunata maskanankupaq. Wakin aspiy llamkaykunapi ispiyal ikipukunata nisisitanku. Himalaya llaqtapi arqueólogo yachaqkunaqa chaykunata ruranankupaq pirmisikunata nisisitanku hinallataq maymanpas siqanankupaq llamkanankuna kananmi.

Department of Immigration  
**TREKKING PERMIT**  
accordance with the rule 33 of  
the permission is for  
in the area of Mustang  
District (except  
to 19

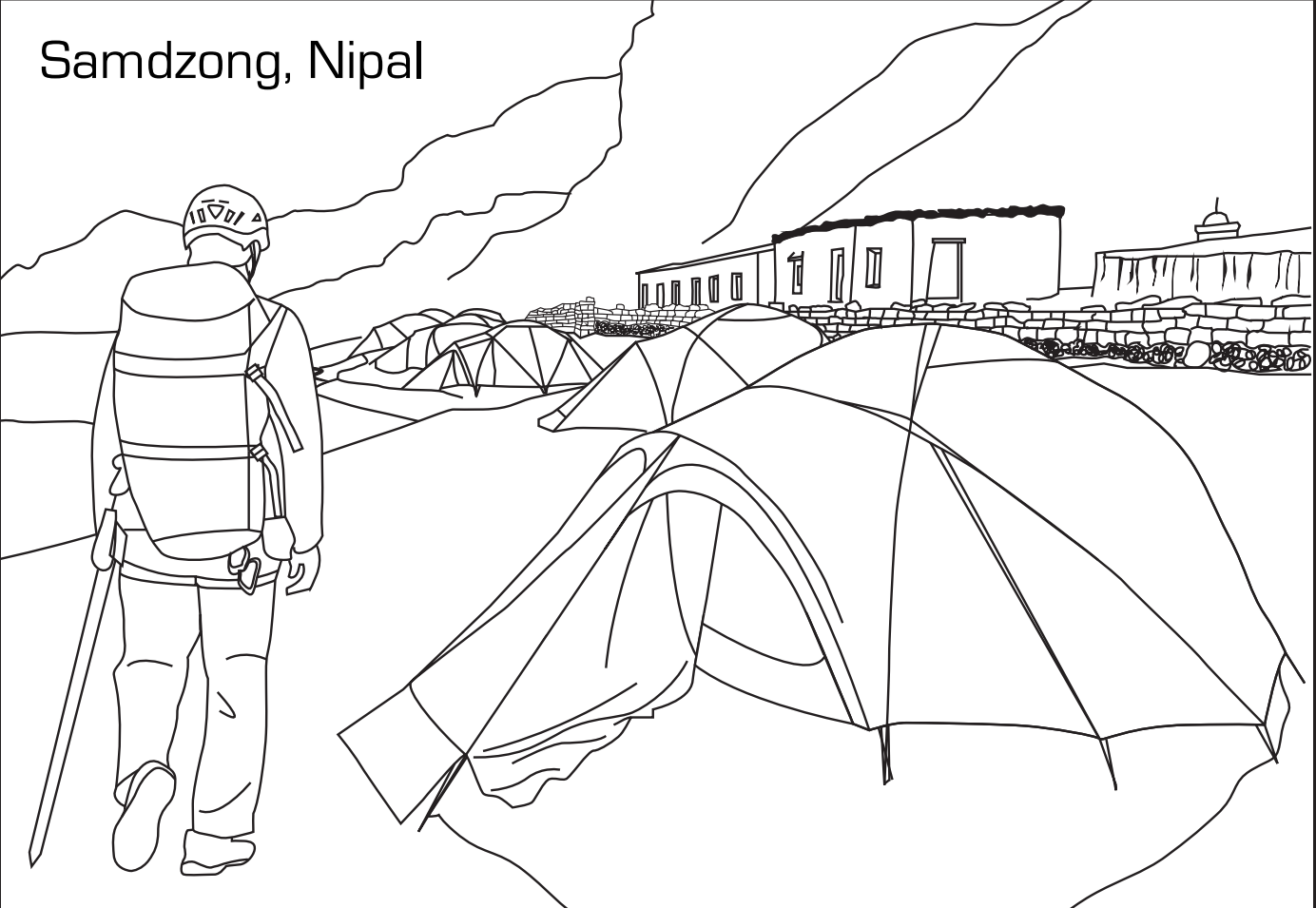
**NATIONAL TRUST FOR NATURE CONSERVATION**  
Entry Permit (ACAMCA/GCA)  
Schedule - 2 (Relating to Sub-Rule (1) of Rule 19)  
Receipt No. **0281630**  
Entry Permit No.  
Full Name:  
Date of Birth:  
Passport No.  
Nationality:  
Purpose of Visit:

**NTNC-ACAMCA**  
**ENTRY FEE RECEIPT**  
Ticket No. **0281630**  
Date  
Nationality  
Authorized Signatory  
Agency Name: **SHERPA SHARDA**

**TOURIST COPY**

Immigration Officer  
No

## Samdzong, Nipal



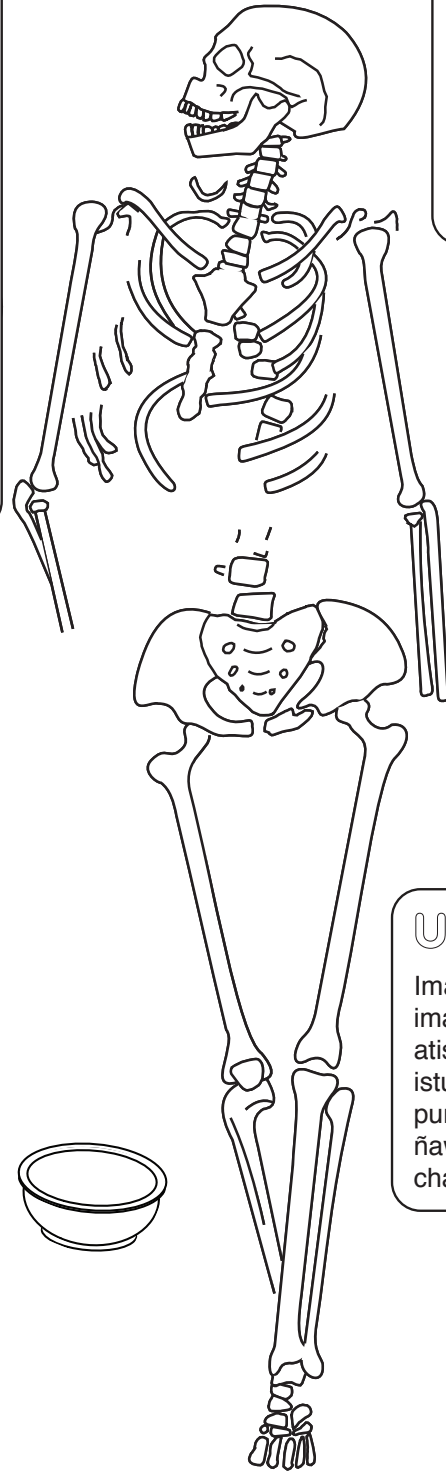


## Kiru aychata punkichiq anaq plakakuna

Placa dental sutiwanpas kiru aychata punkichiq anaq plakakunata riqsinku, kaykunalla llapan wirpunchikmanta kawsasqa kaptinchikraq mana wiñaq hina kakun, manam huk niraq churakunkuchu utaq hukman tikrankuchu. Kiru aychata punkichiq anaq plakakunaqa bakteriakunatawan mikuykunapa puchunkunata hapinku, chaymi kaykunawan ñawpa runakunapa ima mikusqankumanta hinallataq imayna kasqankumanta istudyayta atinqaku.

## Tullukunawan kirukuna

Tullukunapas kirukunapas ADNyuqmi, kaykunawan ñawpa llaqtakunapa astakusqankuta purisqankuta istudyayta atinqaku hinaspa imayna kasqankumanta willakuyta atinqaku, ñawinkunapa utaq chukchankunapa ima niraq kasqanta hinallataq imayna tukuy imankunata tikrarqaku allinta kawsanankupaq llaqta chayasqankuman. Hatun unquy mastakuypi runa wañuqpa kirunpi chay unquchikuqkunapa ADNnkuta tarinkuman.



## Sañupa puchunkuna

Sañukunapi mikuy puchukuna huk niraq puchukunapas, kaykunapi yurapawan uywakunapa proteínankunata, yura uchuy partikulakunatapas, mikuykunapi churasqanku wira yupikunatapas tarinkuman. Kaykunamanta llusiq analisisqa imayna ñawpa runapa mikusqanmanta hinallataq ñawpa llaqtakunapa imayna yanukusqankumanta hinalla imakunawantaq yanurqanku, chaykunamanta ñuqanchikta yachachiyta atinkuman.

## Uywakunapa tullunkuna

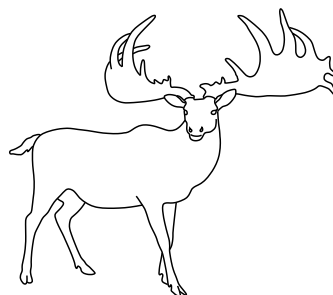
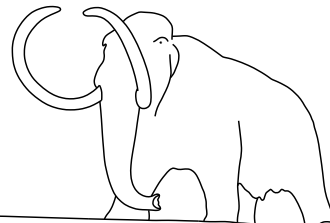
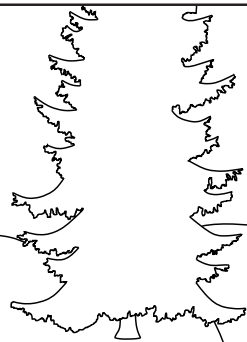
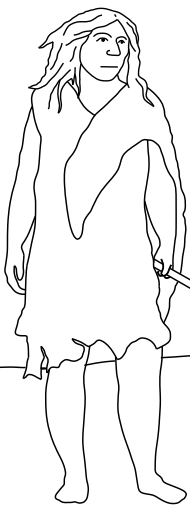
Ima mikusqankumanta ñawpa pachapi imayna economía kasqanmantapas yachayta atisunchikman uywakunapa tullunkunata istudyaspa. Radiocarbonopi rurakusqa punchaw churaypaqpas hinallataq imayna ñawpa tiyanankuna kasqa, chaypaqpas nisyu chaniyuqmi kanqa.

## IMATATAQ ISTUDYANIKU

Bioarqueologokunaqa método científicokunawan nisyu allin tecnologiawanpas llamkanku ñawpaq pacha kawsaykunamanta tapukuykunata kutichinankupaq. Allin ruraykunawanqa uchuy muestramanta, huk tullumanta, huk kirumanta utaq huk puyñumanta achka willakuykunata hurqunkuman.

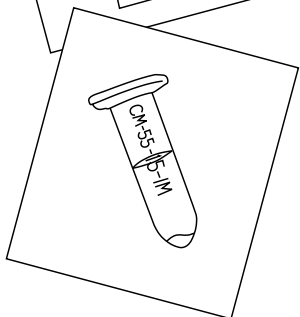
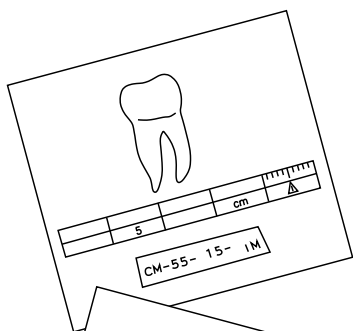
## ¿YACHARQANKICHU...?

Neandertales sutiyaqkunaqa tawa chunka waranqa (40 000) chaychaytaña chinkarunku, ichaqa achka manam África llaqtamanta runakunapa genomkunapi neandertal ADN kawsachkan.



## RUNA MASINCHIKPA PAQARIMUYNINKUNA

Ñawpa ADNqa hichpa hukmanyay primunchikkunata intindinanchikpaq yanapawanchik: neandertales.



## Hukmanyay

Ñawpa runakunapa kirunkunatawan tullunkunata istudyaspa riqsiyta atisunchik imaynatataq ñawpa runa masinchik tiyarqanku hinallataq imaynatataq ñawpa runakuna ñuqanchikman, kunan kasqanchikman, tikrarqanku.



## Escitas, Asia Central

Qillay wata utaq Edad del Hierro sutichasqa, qanchis pachak wata (700) manaraq Dyuspa paqarimuyninga kasqanmanta

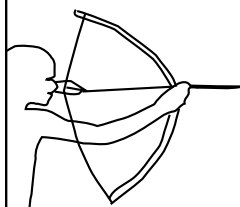
## ÑAWPA ASTAKUYKUNA

Tullukunapiwan kirukunapi ñawpa ADNta tarisqankuqa nisyu ñawpa astakuykunamanta willakuykunata hurqunapaq allinmi kanman. Kayqa isótopo análisis nisqakunawan chaqrurukuptin, radiocarbonopi rurakusqa punchaw churayhina utaq estronciomanta oxigenomantapas isótopo análisisishina, chay astakuykunamanta pachanta, pampantawan timpuntawan, yachayta atichwan.

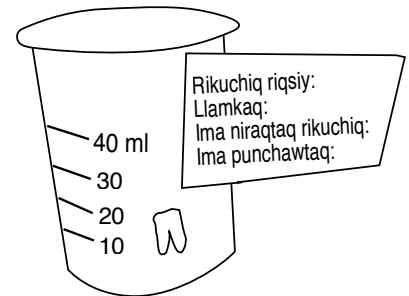


## ¿YACHARQANKICHU...?

Radiocarbono utaq "C" chayna sutichasqa, kayqa huk manam allin takyasqa carbonopa isotoponmi, kaytaqa wayrapi tarinki chaymi yurakuna utaq qurakuna fotosíntesis nisqata ruraptinku chay radiocarbonota ukunkuman churanku. Uywakunaqa radiocarbonota ukunkuman yaykuchinku qurakunata, yurakunata, mikuptinku. Radiocarbonoqa chinkan watapa risqanman hina. Hayka watamantaraq huk organismo nisqa kawsamusqanmanta yachachwan huk ñawpa muestrapi chay carbonota tupuspa.



## Radiocarbonopi rurakusqa punchaw churay

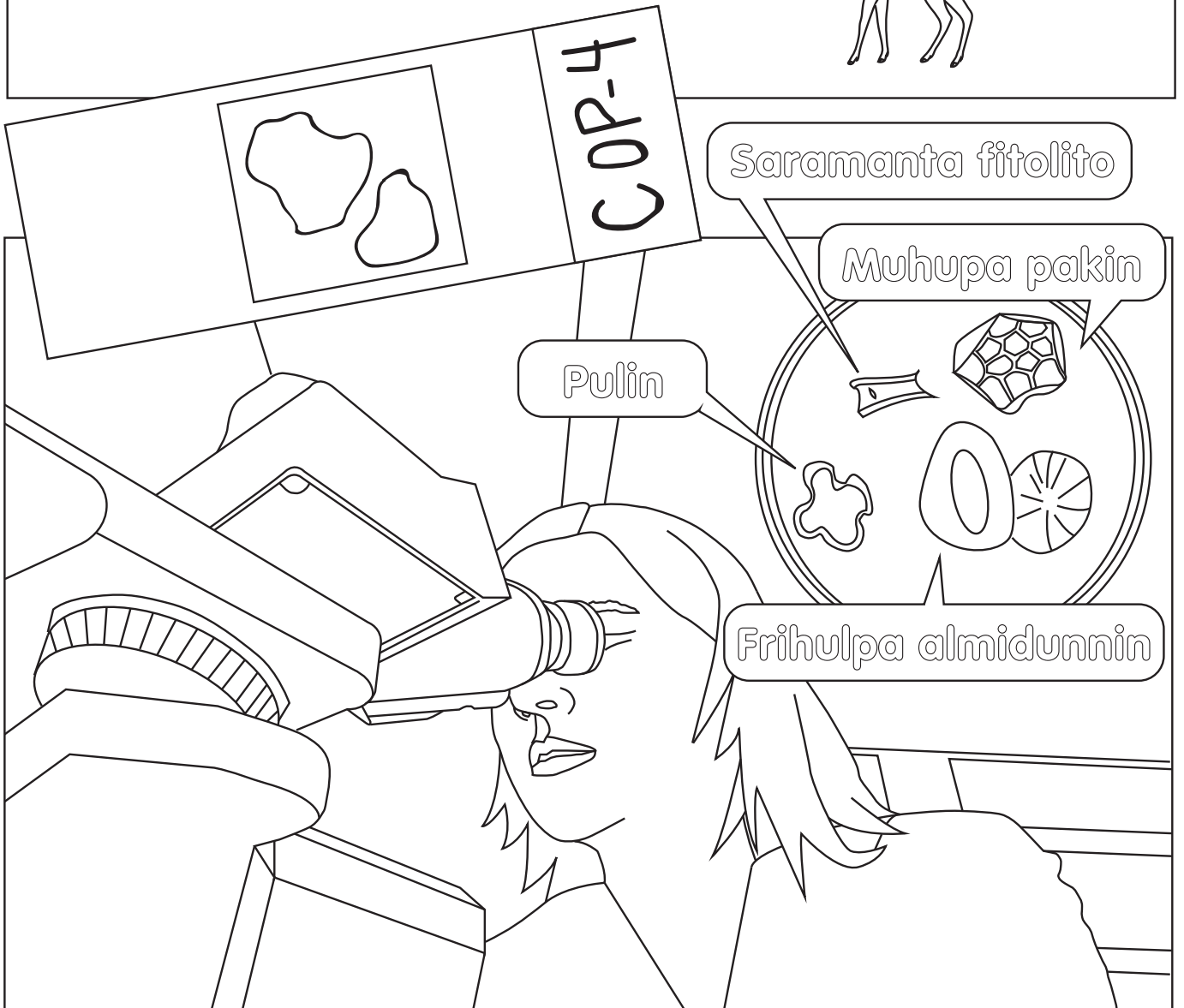


Radiocarbonopi rurakusqa punchaw churayqa huk paqchim, técnica nisqa, kaywan uywakunapa yurakunapapas watankuta yachayta atiwaqmi, tawa chunka waranqa (40 000) watayuq kaptinpas yachayta atiwaqmi.

# ÑAWPA MIKUNAKUNA

Hatunyachaqkunaqa llumpay uchuy imakuna rikuq qawanawan llamkamanku runakunapa kirunkupi ñawpa puyñukunapipas mikuyta puchunkunata tarinankupaq. Imakunataq ñawpa Mesoaméricamanta maya runakuna mikurqanku, iskay waranqa (2000) watayuq hanayman ima, kayta yacharunchik microfosilesmanta analisisista qawaspa.

Copán Ilaqta, Honduras suyupi kachkan, Maya clásico sutichasqa, kimsa pachak wata



## UYWAY RURAY

Chunka waranqa (10 000) watamanta hanaynman, runakunaqa allinta akllaspa llapanmanta allin yurakunata, qurakunata, tarpurqanku, hinallataq allin uywakunatapas uywarqanku. Uywaqa llapan uywakunamanta ñawpaqtaraq allinta tiyanankupaq runakunawan, kуска, uywasqa karqan, ñawpa rikuriq michiqkunaqa kay uywakunamanta lichikunata, aychakunata, qarakunatapas hurqurqanku hinallataq yankirqanku.

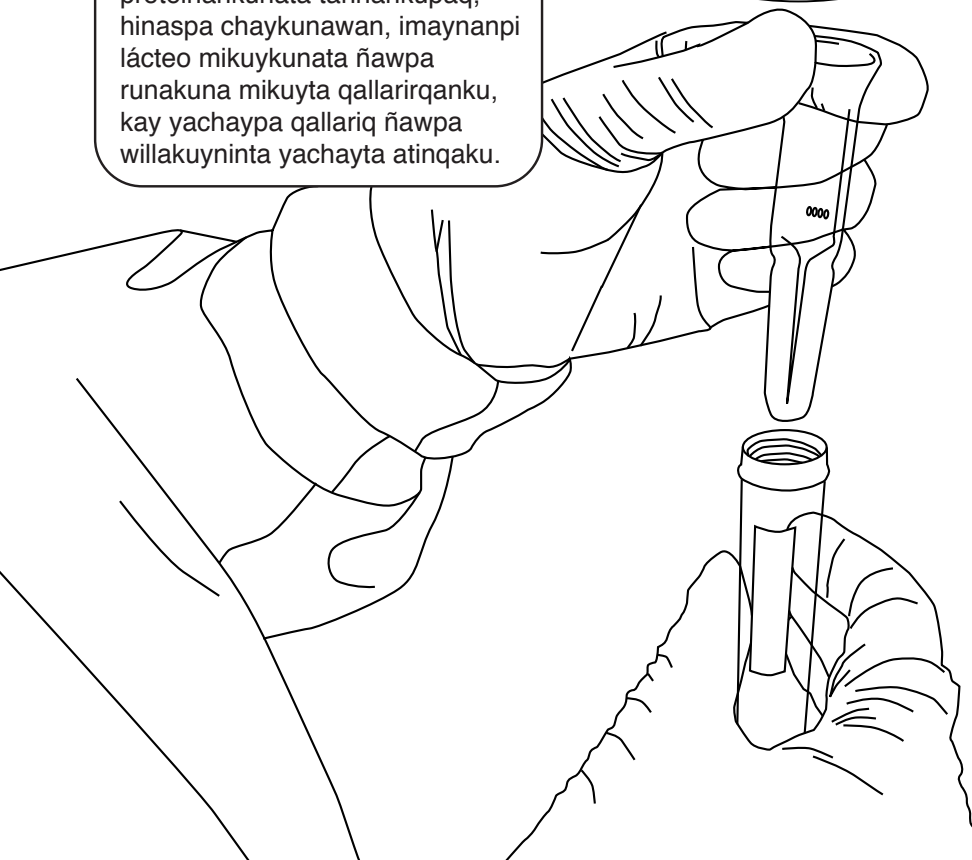
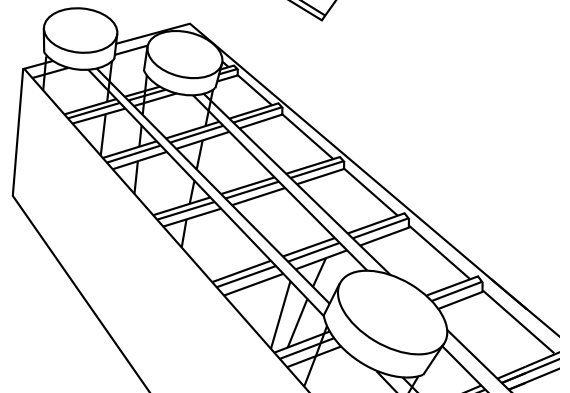
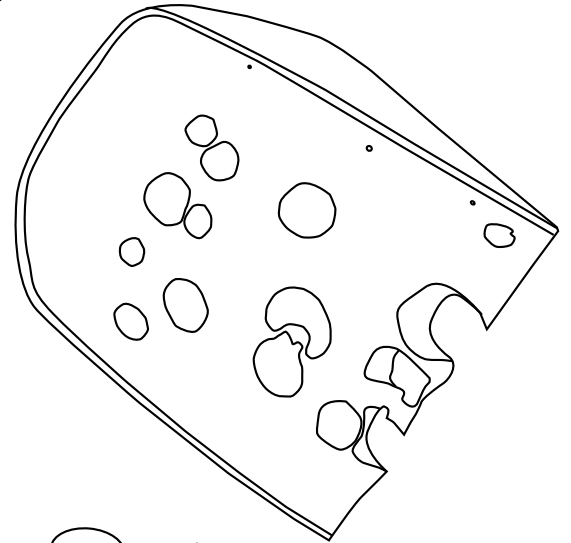
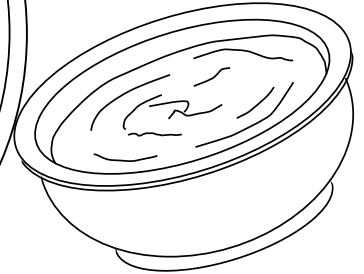
## ¿YACHARQANKICHU...?

Europamanta bisontekuna (urus sutiyuqwanpas riqsisqa karqanku) ñawpaqtaraq uywasqa karqanku chaymi michiqkunaqa chay bisontekunawan yachayaparqanku uywakuna allinta tiyanankupaq runakunawan, kуска. Bisontekunaqa sallqa bóvido ayllumanta llusqin, kaykunaqa nisyu hatunmi karqanku, kananqa manañam kanñachu. Runakunawan tiyanankupaq uywasqa uywakunamanta ñawpaq chiqanchayqa Anatolia peninsulamanta hamun, kayqa Turkiapi tarikun.

## Proteinamanta huk niraq

## Lichimanta mikunakunapa qallaykuyninkuna

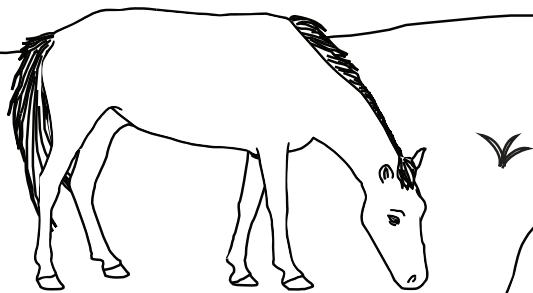
Lichimanta mikuykunapa qallaykuyninkunaqa manam allin riqsisqa kanku, ichaqa bioarqueolokunaqa masamanta espectometría sutiyuq paqchiwan, técnica nisqawan, llamkanku ñawpaq kirukunapi lichipa proteinankunata tarinankupaq, hinaspa chaykunawan, imaynanpi lácteo mikuykunata ñawpa runakuna mikuyta qallarirqanku, kay yachaypa qallariq ñawpa willakuyninta yachayta atinqaku.



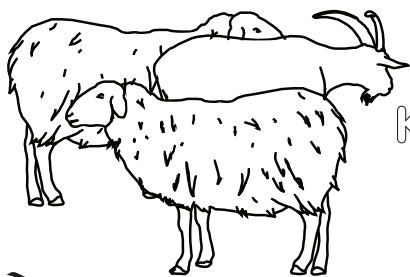
## Mongolia Ilaqta

Achka tukuy niraq uywakuna Mongoliapa purun pampanpim tiyanku, kawallukunapas, wakakunapas, sallqa wakakunapas, kawrakunapas, chitakunapas, tarukakunapas, kamillukunapas kachkan. Puriq michiqkunaqa lichimanta mikuykunata chay uywakunapa lichinkumanta hurqunku.

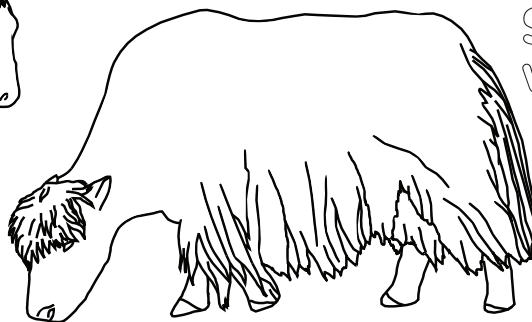
Kawallu



Chita

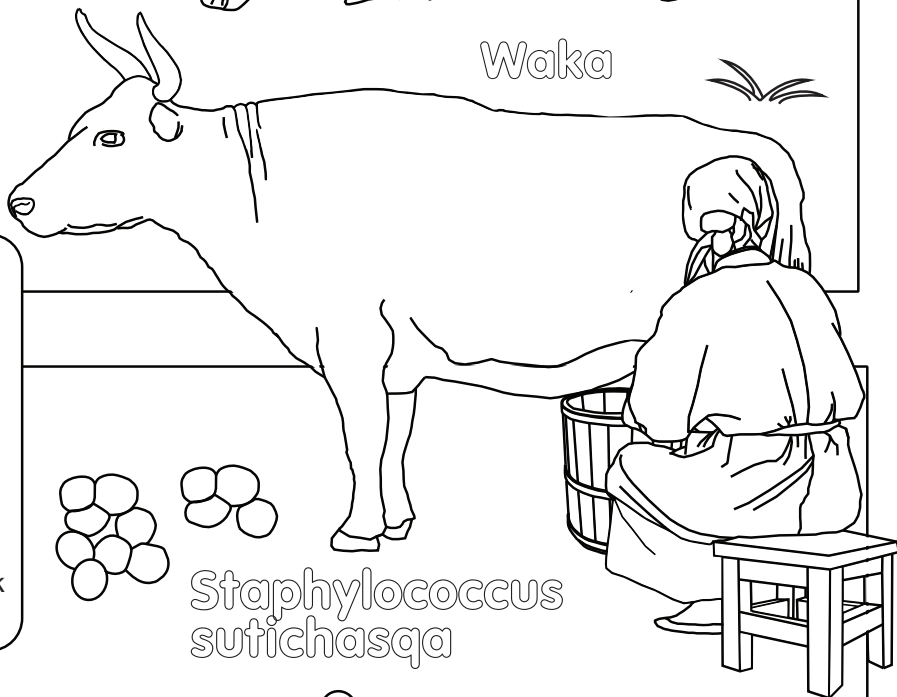


Kawra



Sallqa waka

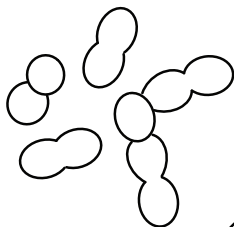
Waka



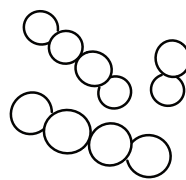
## LICHIMANTA MIKUYKUNA

Mongolia Ilaqtapiqa lichimanta mikuykunaqa nisyu llumpay chaniyuqmi kanku runakuna allin kawsanankupaq. Kay watan watan yachasqa simiqa kimsa waranqa pichqa pachak (3500) watamantaña hamun, kaytaqa yachanchik arqueologíapa maskayninkunamanta.

Staphylococcus sutichasqa



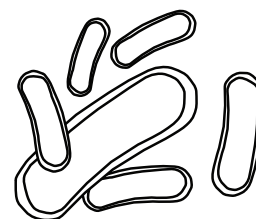
Leuconostoc sutichasqa



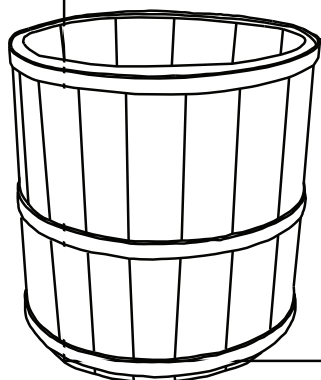
Lactococcus sutichasqa

## Lichipa mikuyninkunapa mikrurrganismunkuna

Kay mikrurrganismunkunaqa, bacteriakunawan levadurakuna, nisyu chaniyuqmi kanku achka tukuy niraq lichimanta mikuykunata ruranankupaq, yugurta, mantikillata, kisuta, mana riqsisqa hukkunatapas chaki rikisunta hina, aaruul sutiuyuq, kawallu lichimanta sirwisatapas hina, "airaq" sutiwan Mongoliapi riqsinku, ruranku.



Lactobacillus sutichasqa



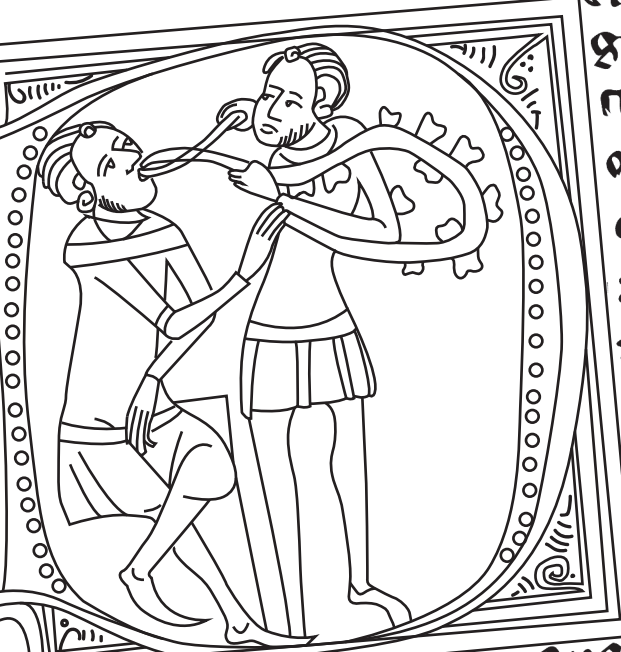
# ÑAWPA UNQUYKUNA

Tullukuna, kirukuna, kirukunapa qanrankunapas ñawpa runakunapa saludninmanta nisyu chaniyuq willakuykunata waqaychanku. ADN, proteina hinakuna waqaychasqa kirukunapa qanrankunapi kachkan, kayqa hatunyachaqkunaman yanapan kiru aycha punkichiq unquypa kirupa tihidunkuna usyaq unquypapas ñawpa willakuyinkuta allinta intindinankupaq.

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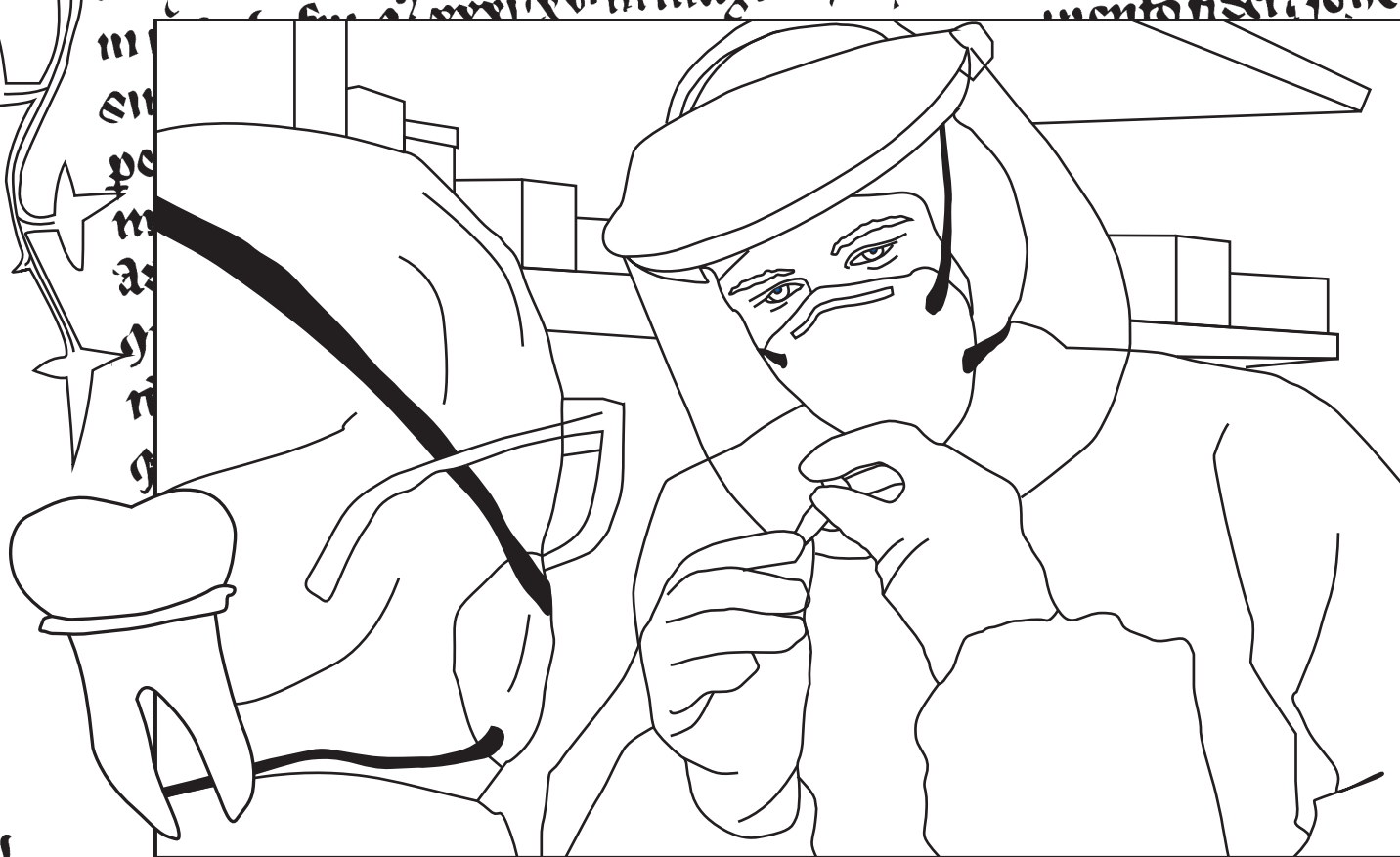
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### Omne Bonum maytu

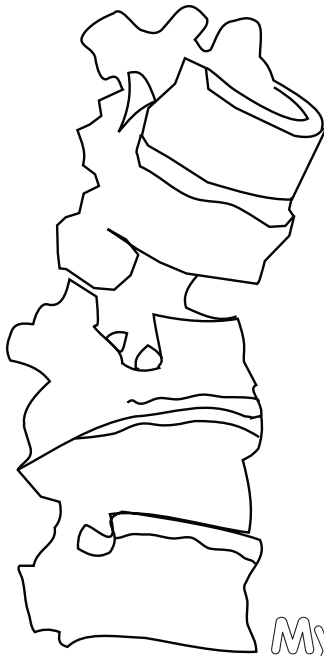
Omne Bonum sutiyuqqa hatun maytum, XIV (chunka tawayuq) siglumanta latin simipim kachkan, kay hatun maytuqa imayna Europa medievalpi kawsay karqan, chaymanta willakun, Real Britanica ñawinchana wasipi waqaychakun. Hinallataq kiru istudyaq hatunyachaymantapas imayna hampikunapaq, kaymantapas ñawinchanakuna kachkanmi. Kaykunaqa yanapawanchik astawan allinta intindinanchikpaq imayna allin kananchikmantawan Edad Mediapim imayna unquykunamantapas.

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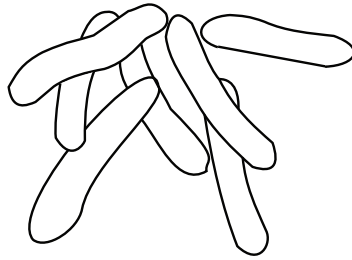
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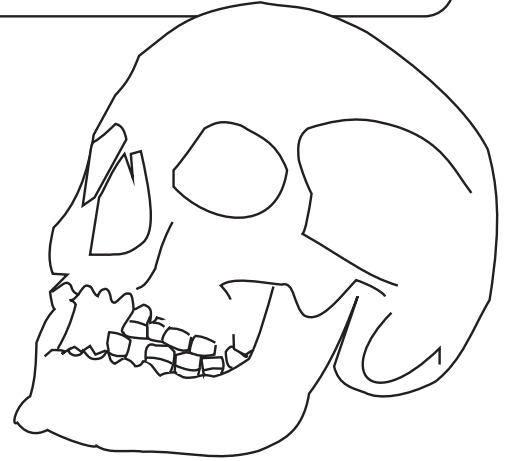


## TUBERCULOSIS UNQUYWAN LEPRA UNQUY

Tuberculosis unquyqa lepra unquypas chay hinalla bacteriamanta rikurimunku: Mycobacterium tuberculosis nisqawan Mycobacterium leprae. Iskayninmi tullukunata unquchinma; aya tullupi ADNkuna tarikusan hatunyachaqkunata yanapan ñawpa unquykunamanta imaynatataq karqanku, imaynanpi rikurimurqanku, chaykunamanta yachanankupaq.

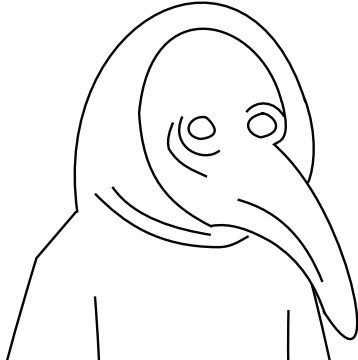
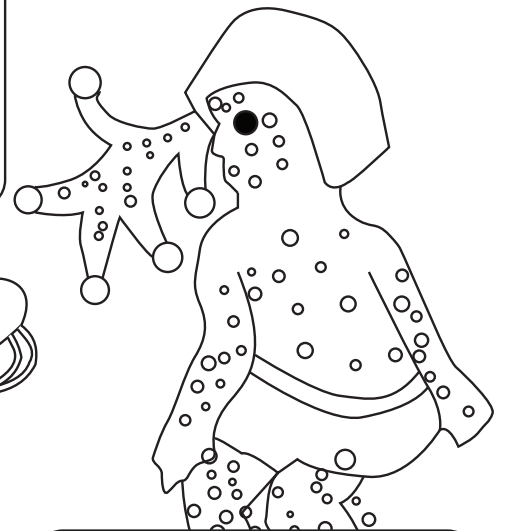


Mycobacterium leprae

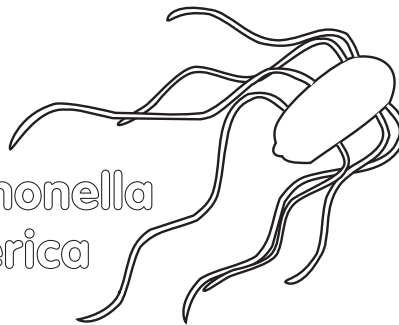


## COCOLIZTLI SUTIIYUQ UNQUY

Mana riqsisqa unquy mastakuy, Cocoliztli sutiuyuq, Azteca aylluqa chay sutiwan riqsisqa, yaqa suqta chunka pursintumanta (60%) isqun chunka pursintukama (90%) México suyumanta runankunata sipirqan, waranqa pichqa pachak tawa chunka pichqayuq (1545) watamanta waranqa pichqa pachak pichqa chunka (1550) watakama. Qipataña wañuq runakunapa kirunkupi Salmonella enterica Paratiphu unquypa ADNnta tarirqanku.

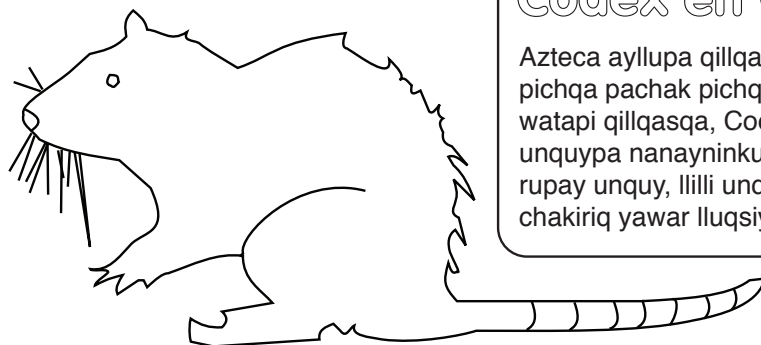


Salmonella enterica



## Hampiq Schnabel

Chunka qanchisniyuq (XVII) siglopi hampiqkuna chay hatun unquywan unquqkunata hampinankupaq maskarakunawan churakurqanku mana allin wayrakunamanta amachakunankupaqpunim, chay maskarankunaqa pisqunapa umankuna hina karqanku.

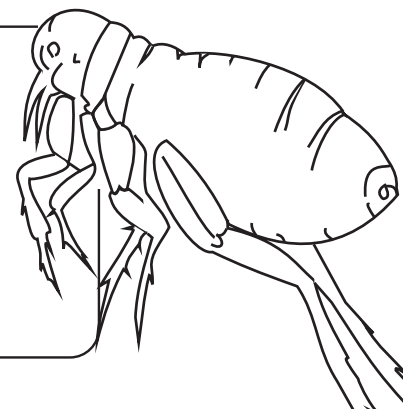


## Codex en Cruz

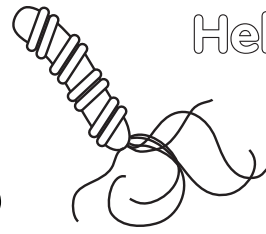
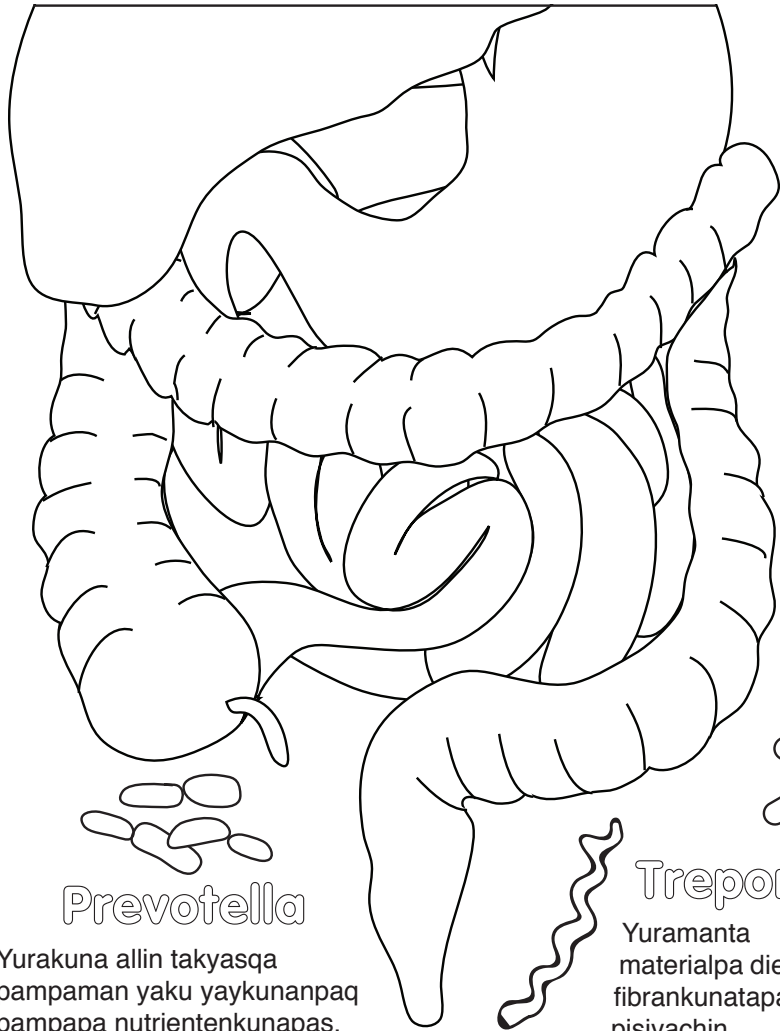
Azteca ayllupa qillqan, waranqa pichqa pachak pichqa chunka watapi qillqasqa, Cocoliztli unquypa nanayninkunata rikuchin: rupay unquy, lilli unquy, mana chakiriq yawar llusqiypas.

## UNQUY

Unquyqa bacteria Yersinia pestis nisqankumanta rikurimun, kay unquyqa hatun ukuchapa pikinkunamanta miran. Chay pikipa kanisqan runakupiqa chay peste bubónica unquyqa hatarin, rikurimun. Chay unquyrayku Yana Wañuy utaq Muerte Negra nisqa rurarakun (1346, waranqa kimsa pachak tawa chunka suqtayuq watamanta, 1353, waranqa kimsa pachak pichqa chunka kimsayuq watakama) kay watakunapi Europa suyupi achka runata wañuchisqa.

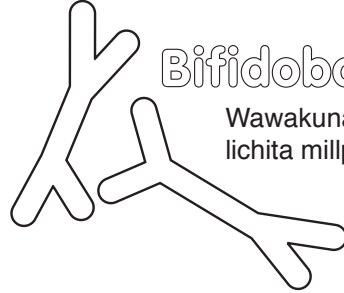






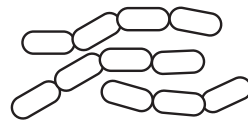
## Helicobacter pylori

Wiksapi tiyan chaymi wiksapa pirqankunapi kirikunata hatarichin, úlcerata sutiyuq, hinallataq chay cáncer unquyapas hatarichinman.



## Bifidobacterium

Wawakunata yanapan lichita millpunankupaq



## Faecalibacterium

Chunchullpa celulankunapaq mikuykunata ruran

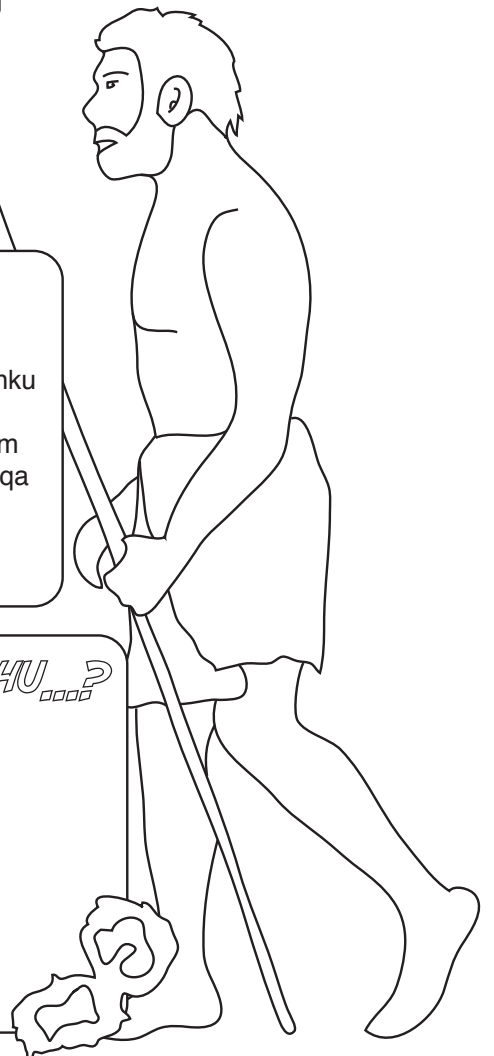
## Prevotella

Yurakuna allin takyasqa pampaman yaku yaykunanpaq pampapa nutrientenkunapas, chay niraq yurakunata wirpuman allinta yaykunanpaq yanapan.



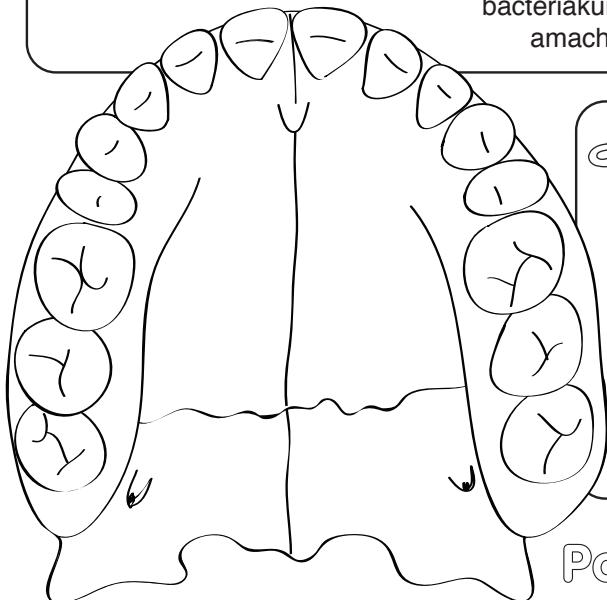
## Treponema

Yuramanta materialpa dietapa fibrankunatapas pisiyachin.



## ÑAWPA MICROBIOMAKUNA

Wirpuykipiqa achka achka bacteria celulakuna tiyanku, llapan huñupi kaptinku microbiomawanmi sutichanku. Bacteriakunaqa chunchullniykipi tiyaqkuna yanapasunki mikuykuna wirpuykiman allinta yaykunanpaq hinallataq manam mayqin unquypas yaykusunaykipaq kallpachisunki. Qaraykipi bacteriakunaqa mana qanra kanaykipaq yanapasunki, chaymantapas simiykipi bacteriakunaqa unquykunamanta amachasunki.



## ¿YACHARQANKICHU...?

Hatunyachaqkunaqa Kiru aychata punkichiq anaq plakakunata paleoheces nisqatapas istudyanku ñawpa microbiomakunata tarinankupaq hinallataq allinta intindinankupaq imanasqataq unquykuna rikurimun.

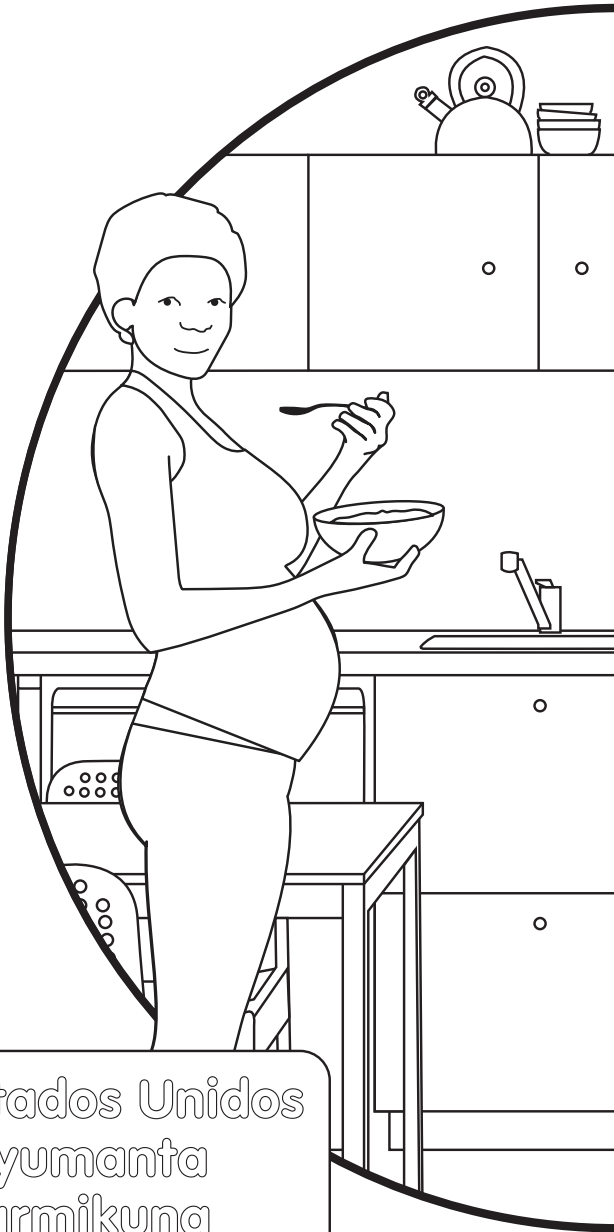
## Porphyromonas

## HUÑUQKUNA, PALLAQKUNA

Huñuqkunataqa, pallaqkunataqa, uywa hapiqkuna-huñuqkuna sutiwanpas riqsinku, sallqapi wiñaq kawsaykunata mikunku, paykunaqa sapa mitapi huk niraq mikuyta mikunku kawsaykuna rikurimuqman hina, sapa mitapi huk niraq kawsaykuna rikurimunku chaymi paykunaqa chayman hina mikuyninkunata rurakunku. Manaraq allpa llamkay kaptinraq, yaqa chunka hunu (10 000) wata qipaman, llapan runakunaqa huñuqkuna, pallaqkuna, karqanku. Kunan huñuqkuna, pallaqkuna, chunchullninkupi tukuy niraq microbiomakuna kachkan aswan hukman kanku hatun llaqta tiyaq runakunapamanta.



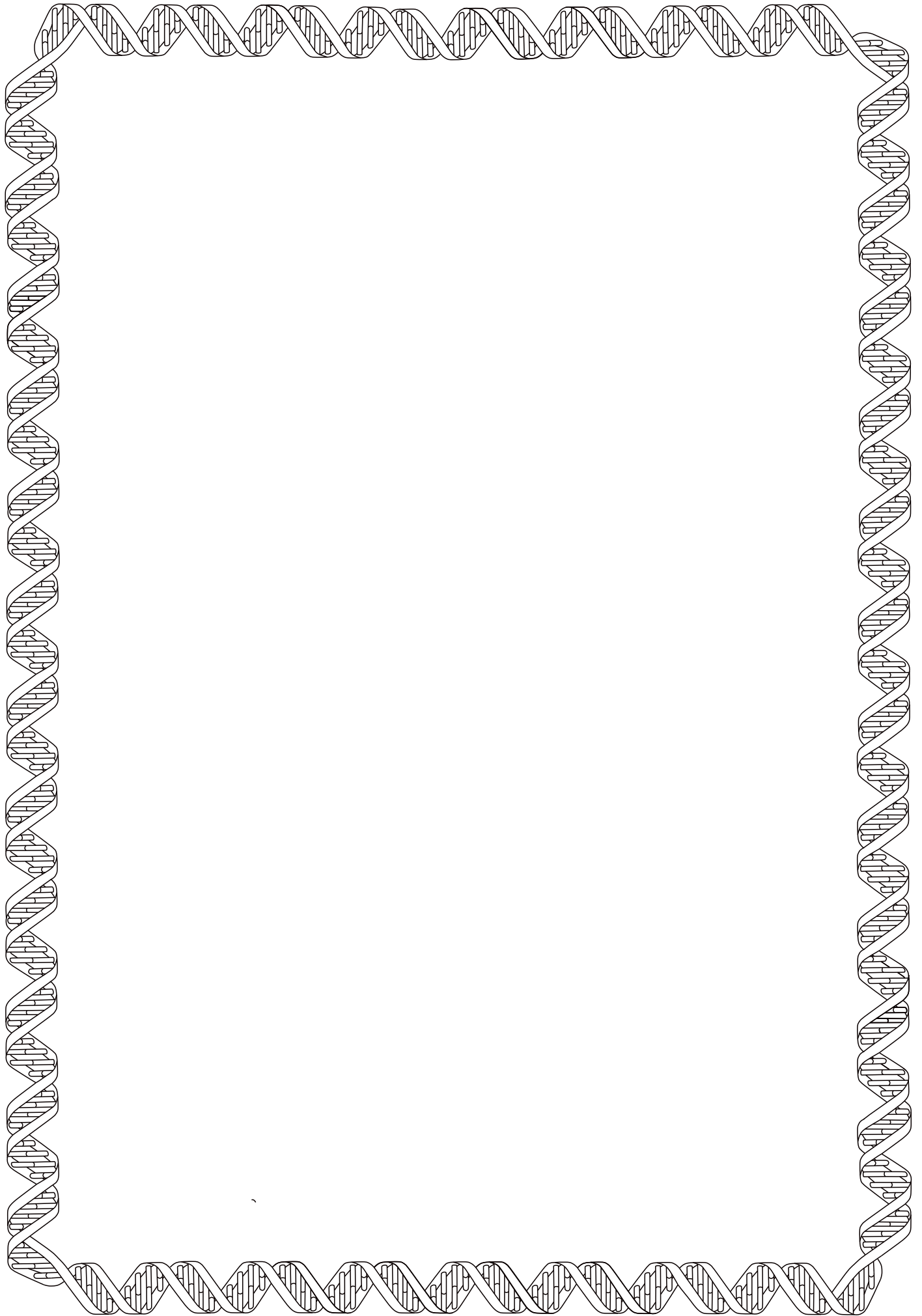
Hadza ayllumanta  
warmiwan wawa,  
Tanzania suyumanta



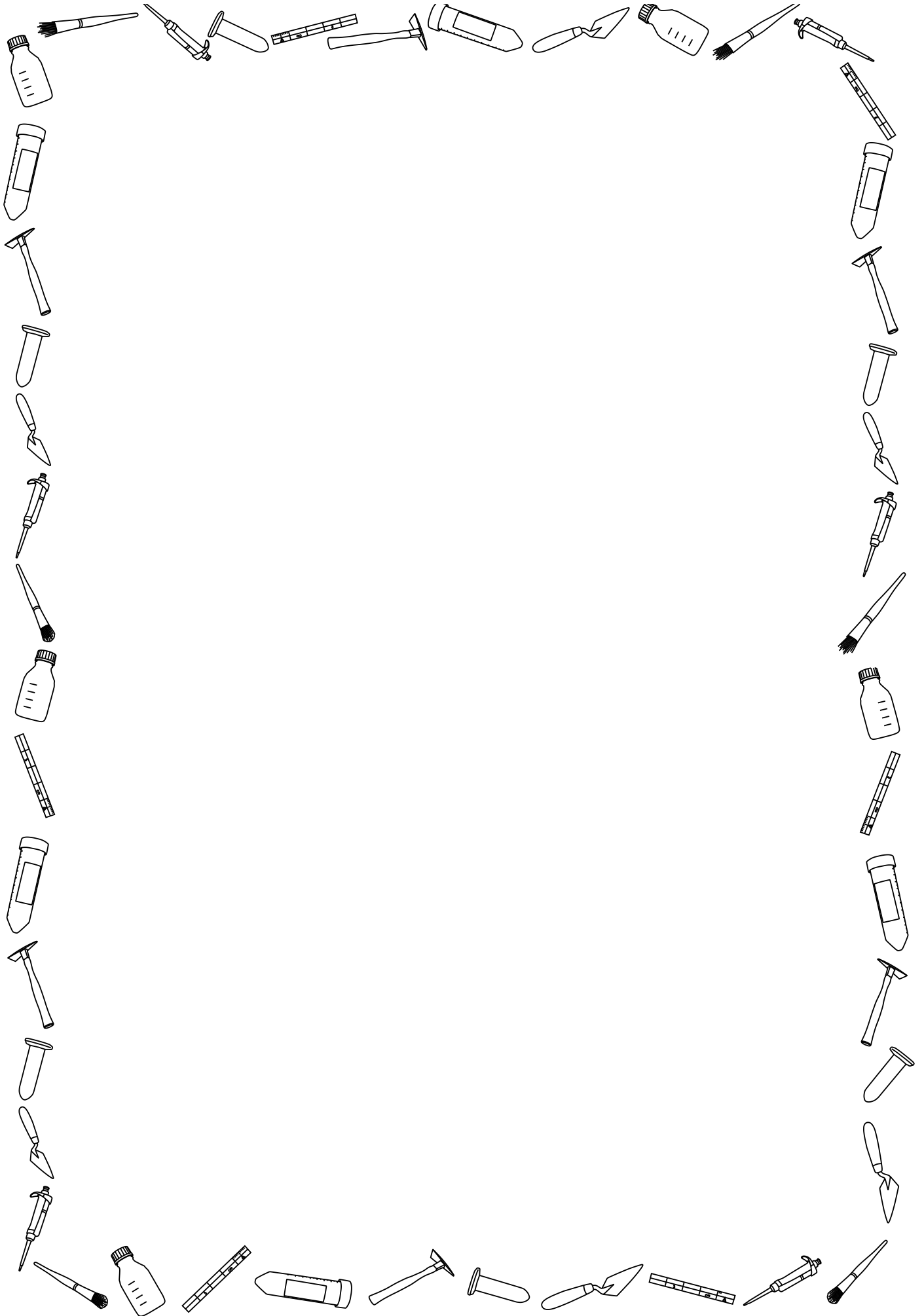
Estados Unidos  
suyumanta  
warmikuna

## HATUN LLAQTAPI TIYAQ AYLLUKUNA

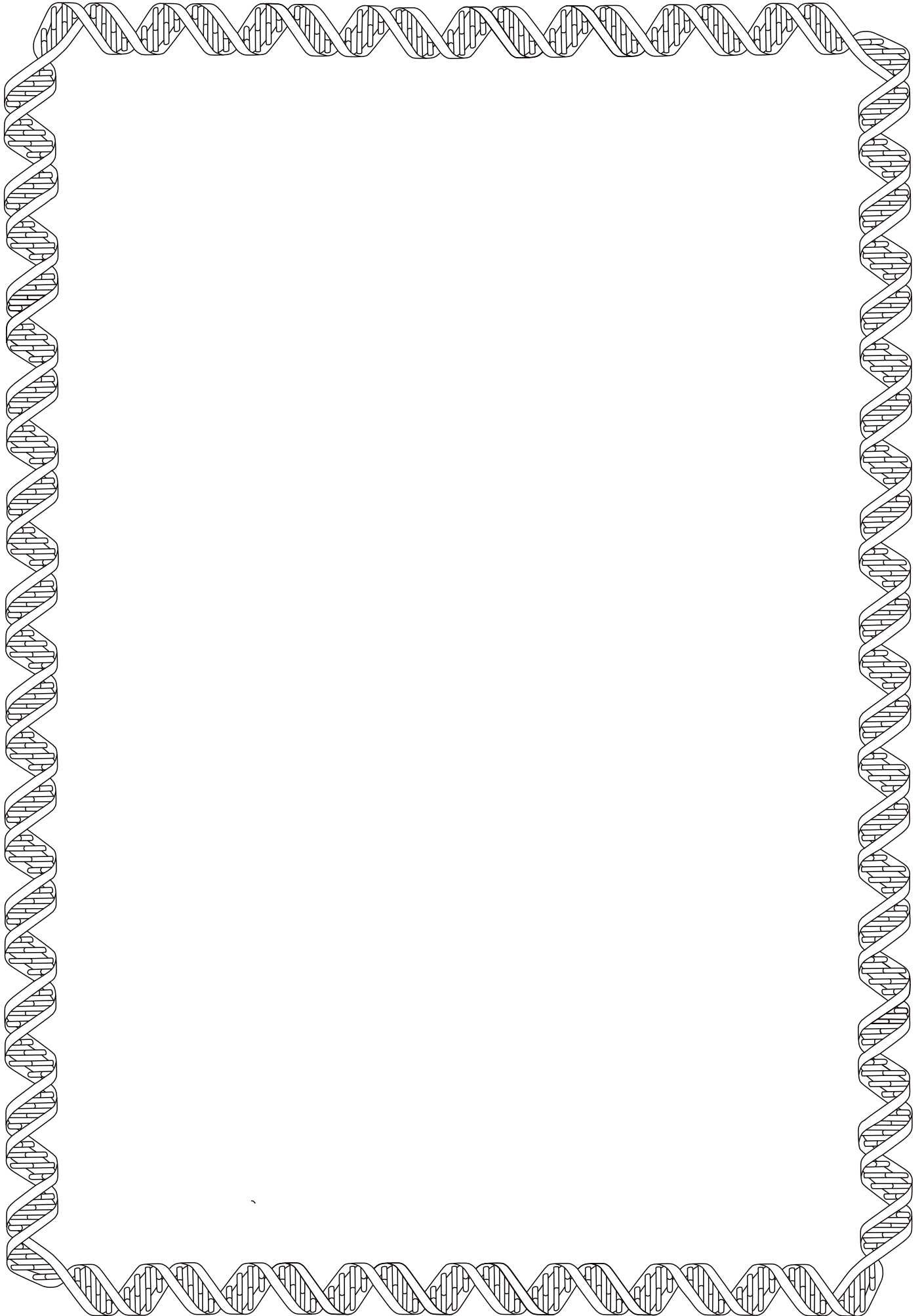
Hatun llaqtapi tiyaq ayllukunaqa allpamanta llusiq kawsaykunata astawan mikunku ichaqa kawsaykuna tarpuypiqa wakin runalla llamkanku, kay llamkayqa sasam, allin yachaqkunallapaq. Makinakunawan llamkaypas amachaypas waqaychaypas nisyu chaniyuqmi kanku rurasqa mikuyta atinanchikpaq mikuykunapi, chay alimentos procesados nisqapi, hinallataq makinchikman yachananpaq hatun ñankunantaraq rin, karu karu llaqtamanta hamuq hina. Hatun llaqtakunapi tiyaq runanakunaqa microbiomayuqkuna kachkanku, kaykunaqa manam achka niraqkunachu hinaspa mana kallpayuq hinata wirpunkuta churaykunku chaymi mana kacharikuq punkichiq unquypas manam sasachakuspa yaykurparinku.





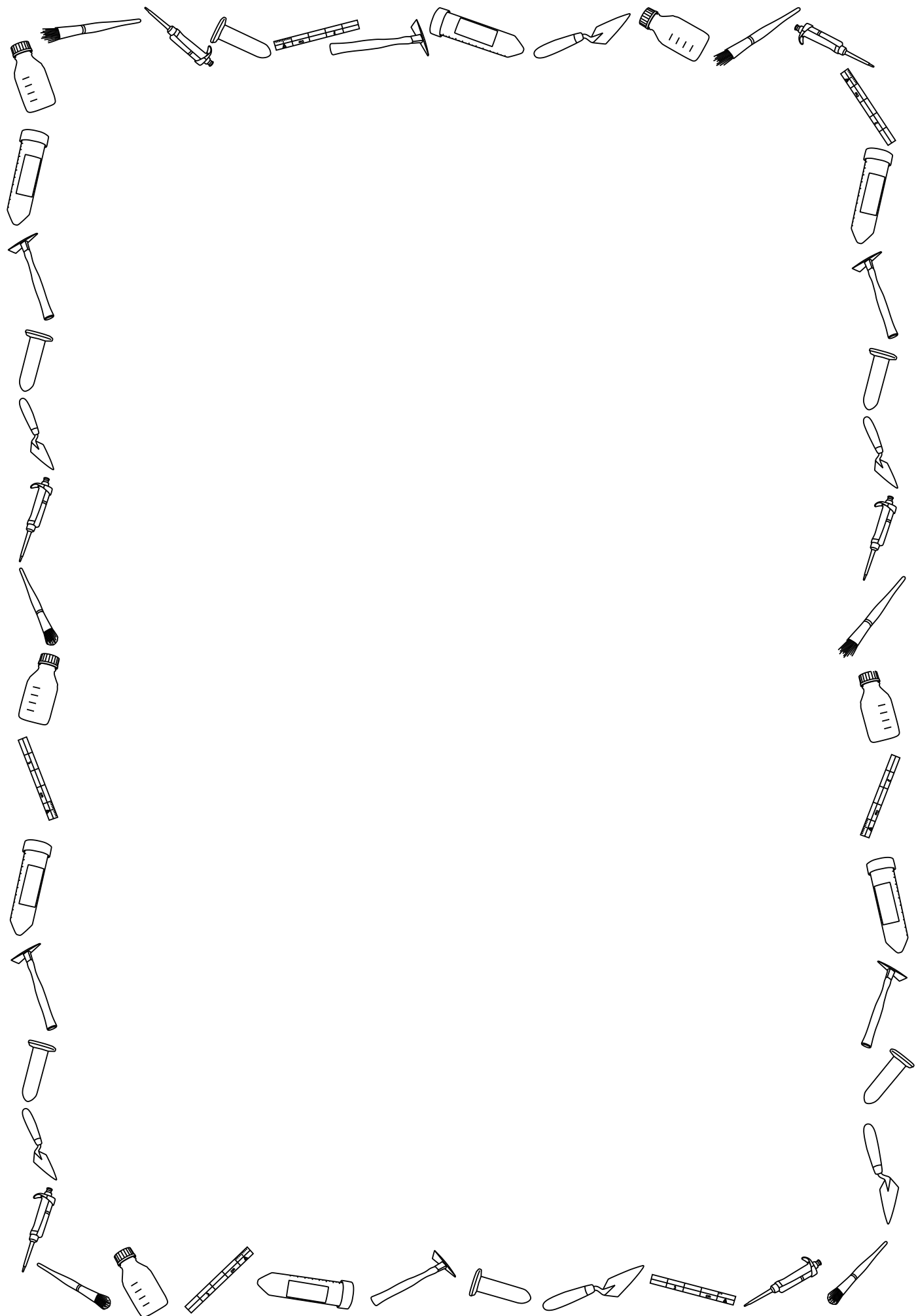




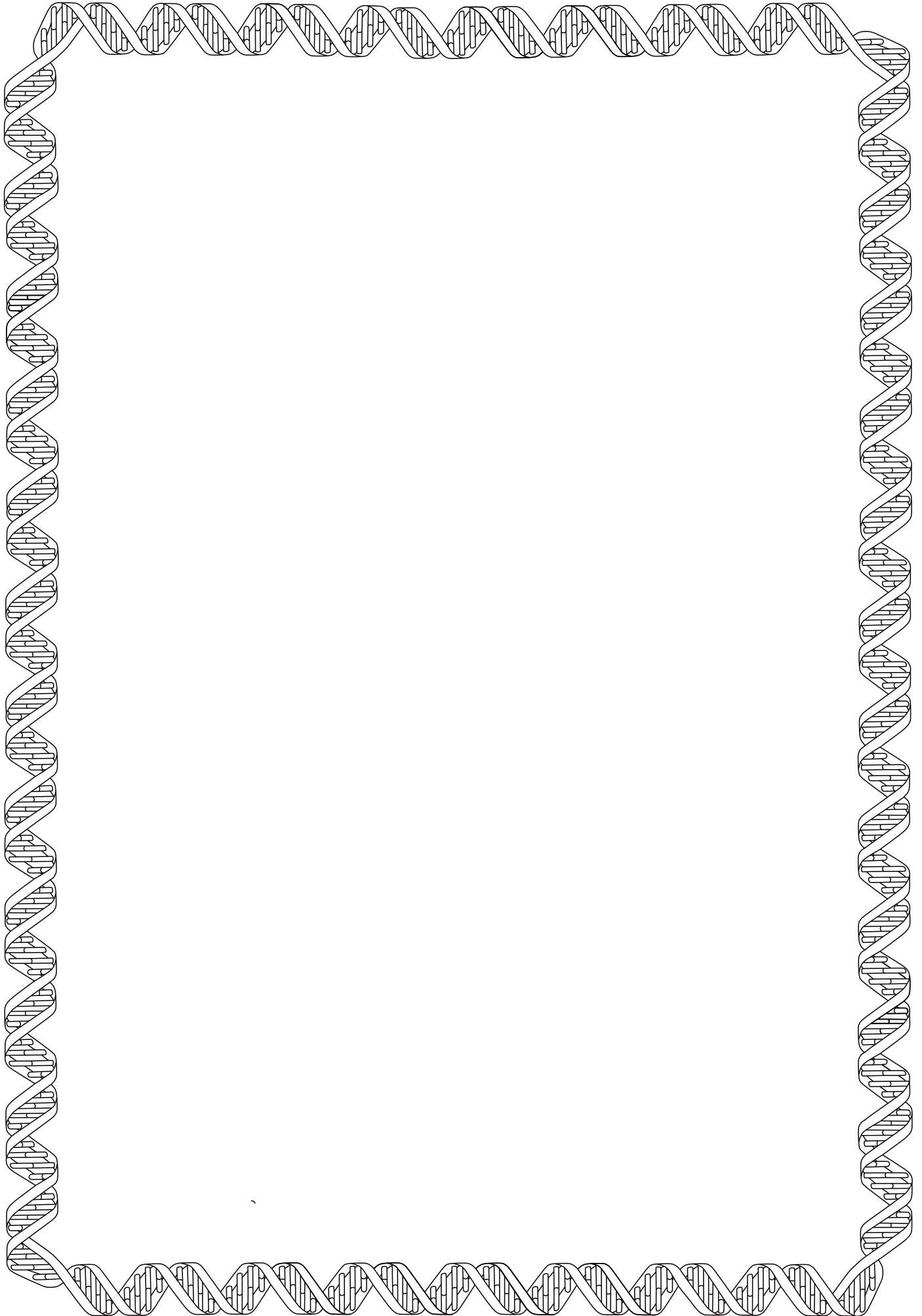






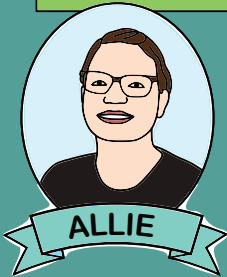




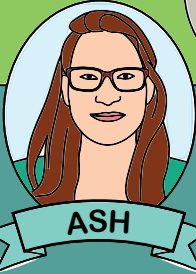




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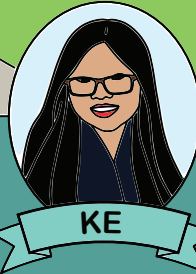
ALLIE



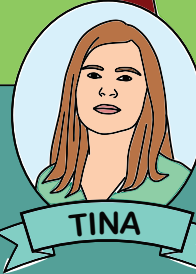
ASH



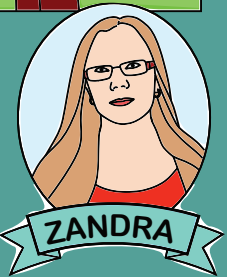
JESSIE



KE



TINA



ZANDRA

## Huk niraq puriykuna

# CIENCIA ARQUEOLÓGICA NISQAPI Maytu Ilimpinapaq

¡Yachaykuy imayna arqueologokunawan bioarqueologokuna kуска llamkanku ñawpaq runanchikkmanta kutichiykunata kutichinankupaq! Kuska puririsun maskaypi pikunataq kaniku hinallataq imatataq yachaniku, runapa qallaykuyninmanta peste medievalkama. Ñawpaq astakuykunamantapas, paqarichimuq Ilaqtankumanta llusqiy, radiocarbonopi rurakusqa punchaw churaymantapas yachaykuy. Chaymantapas riqsiykuy imaynatataq ciencia yachaqkuna ñawpaq runakunapa mikusqankumanta hatun willakuyta maskachkanku imayna karqa yachanankupaq, nisyu uchuy qura, yuyu puchukunamanta yachanqaku. Uywaymanta chaymantapas lichi mikuykunamanta yachay munaqniyuq willakuykunata maskaykuy. Unquykunamanta ñawpaq unquy mastakuykunamantapas maskaykuy hinaspa chay ñawpaq runapa microbioma nisqanta tariykuy.

Yachay Wasi Max Planck de Ciencias de la Historia Humana hatunyachaqkunapa rurasqanku.

Runamisiman Alondra Loayza Puga, Mary Luz Loayza Puga tikrarqanku.



ALONDRA



MARY LUZ