

## Atmung

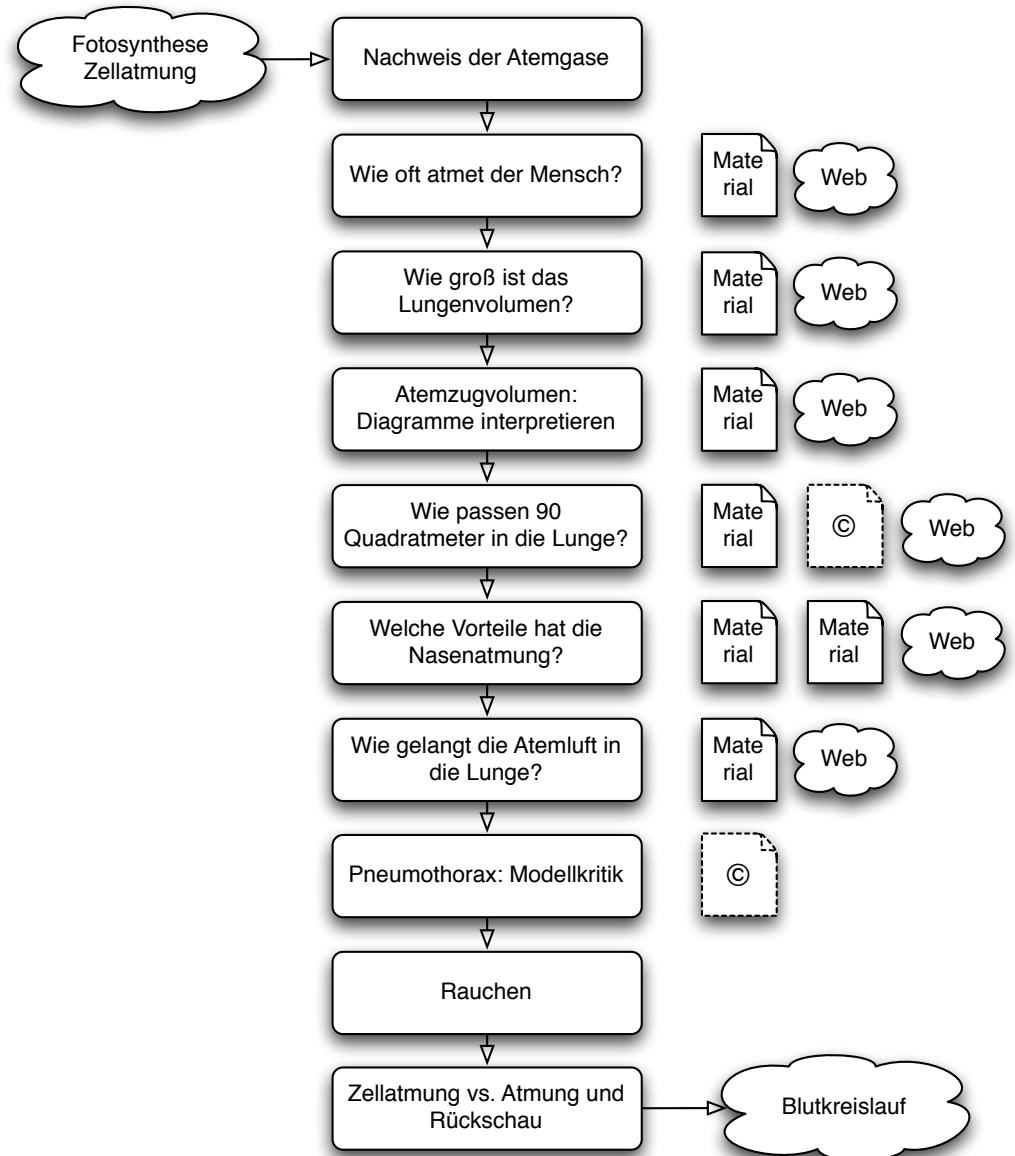
Eine problemorientierte Reihe  
mit Bezug zum Kerncurriculum

Nils Raschke • Alexandra Schmidt  
Gymnasium Ritterhude

Ausführlichere Unterrichtsskizzen und Einzelmaterialien  
finden Sie zu den Abschnitten, die mit der „Web“-Wolke  
in der Übersicht gekennzeichnet sind, auf

[www.biologieunterricht.info](http://www.biologieunterricht.info)

## Verlaufsplan

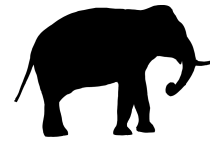


Zeit	Einheit	Prozessbezogene Kompetenzen	Inhaltsbezogene Kompetenzen	Bemerkungen
	<p><i>Vorwissen / Voraussetzungen</i> <i>Fotosynthese und Zellatmung sind behandelt worden. Es ergibt sich die Frage, wie der nötige Sauerstoff in die Zellen gelangt, dadurch wird das Thema Atmung motiviert.</i></p>			
12	<b>Atmung</b>			
1	<b>Nachweis der Atemgase</b> Die Schüler führen Versuche zum Nachweis der Atemgase durch.	EG1.1b, EG2.3b, EG2.5b		
1	<b>Wie oft atmet der Mensch?</b> Aus dem Vergleich mit Werten aus dem Tierreich ergibt sich die Problemfrage wie oft ein Mensch atmet. Die SuS zählen ihre Atemzüge vor und nach Belastung. Die SuS werten ihre Ergebnisse aus und erstellen eigenständig Diagramme. SuS erstellen ein Versuchsprotokoll.	EG2.1b, EG2.7c  KK2b  EG2.5b		AT liegt bei
1	<b>Wie groß ist das Lungenvolumen?</b> Comic evoziert Problemfrage. SuS entwickeln Versuchsansätze und führen sie durch. SuS werten ihre Ergebnisse aus und erstellen eigenständig Diagramme. SuS erstellen ein Versuchsprotokoll. SuS evaluieren den Versuchsaufbau, Vergleich der Messmethoden	EG2.1b, EG2.7c  EG2.3b KK2b  EG2.5b EG2.6b		AT liegt bei
	<b>Atemzugvolumen</b> SuS interpretieren ein komplexes Diagramm zu Atemvolumina.	EG1.1c		AT liegt bei

Zeit	Einheit	Prozessbezogene Kompetenzen	Inhaltsbezogene Kompetenzen	Bemerkungen
2	<p><b>Wie passen 90 Quadratmeter in die Lunge?</b> Über einen Vergleich mit einem Luftballon ergibt sich die Problemfrage. Fachgerechte Präparation einer Schweinelunge</p> <p>Auswertung der Beobachtungen. SuS bearbeiten ein Arbeitsblatt zum Lungenaufbau und den Lungenbläschen.</p>	EG2.1b, EG2.7c  EG2.4b	FW1.2b FW1.1b	AT liegt bei  Evtl. mikroskopieren der Lungenbläschen  AB aus urheberrechtlichen Gründen nicht beigelegt
1	<p><b>Welche Vorteile hat die Nasenatmung?</b> Eine merkwürdige Erfindung erzeugt eine Problemhaltung zur Mundatmung. SuS interpretieren ein Diagramm zur Mund- und Nasenatmung und erschließen sich damit deren Funktionen.</p>	EG2.1b	FW1.1b	AT liegt bei  AT liegt bei
1	<p><b>Wie gelangt die Atemluft in die Lunge?</b> Die Problemfrage ergibt sich aus dem Vergleich mit der Mundhöhlenbodenatmung der Frösche. SuS beobachten und deuten ihre Atembewegungen, unterscheiden Brust- und Bauchatmung. SuS nutzen Modelle zur Klärung der Vorgänge im Körper. Rückbezug Frosch: Kein Brustkorb.</p>	EG2.1b, EG2.7c  EG1.2  EG2.6b  EG3.1b  EG1.2	FW2.1b	Konzeptwechsel notwendig, Präkonzepte aufgreifen! AT liegt bei     AT liegt bei

Zeit	Einheit	Prozessbezogene Kompetenzen	Inhaltsbezogene Kompetenzen	Bemerkungen
1	<p><b>Erweiterung der Vorstellung zur Einatmung: Pneumothorax</b></p> <p>Ein Fallbeispiel führt zur Problemfrage wieso man mit einem Loch in der Lunge nicht gut atmen kann.</p> <p>SuS interpretieren Röntgenbilder und beschreiben mit Hilfe eines Modellversuchs die Wirkung des flüssigkeitsgefüllten Hohlraums.</p> <p>Das neue Wissen wird zur Modellkritik am Modell der Zwerchfellatmung genutzt.</p>	<p>EG2.1b</p> <p>EG3.1b</p> <p>EG3.2b</p>		<p>AT aus urheberrechtlichen Gründen nicht beigelegt</p> <p>AT aus urheberrechtlichen Gründen nicht beigelegt</p>
3	<p><b>Rauchen</b></p> <p>Über die Bestimmung, dass Rauchen für Jugendliche unter 18 Jahren in der Öffentlichkeit verboten ist, wird das Thema angerissen und zur Diskussion gestellt. SuS diskutieren ihr Vorwissen, ihre Einstellungen und ihr Verhalten.</p> <p>Die SuS werten einen Versuch zum Nachweis von Teerstoffen im Zigarettenrauch aus.</p> <p>SuS informieren sich in einer Internetrecherche über die Gefahren des Rauchens und bereiten eine Ausstellung in der Schule vor.</p>	<p>BW1b, BW2b, BW3b</p> <p>EG4.1c</p>		
1	<p><b>Atmung vs. Zellatmung</b></p> <p>Betrachtung verschiedener Ebenen bei der Atmung: Umgangssprache „Atmung“ vs. Zellatmung. Rückschau auf das Thema.</p> <p>Allgemeine Nebenstehende Kompetenzen werden in jeder Unterrichtsstunde geübt.</p> <p><i>Anschlussmöglichkeiten</i> <i>Der Weg des Sauerstoffs zu den Zellen ist immer noch nicht geklärt, daher muss sich der Themenkomplex Blut und Blutkreislauf anschließen.</i></p>	<p>EG2.8b</p> <p>KK1b, KK3b</p>		

## Atemfrequenz (Atemzüge pro Minute)



Elefant

6



Hund

18

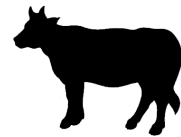


Kolibri

250



Mensch



Rind

30

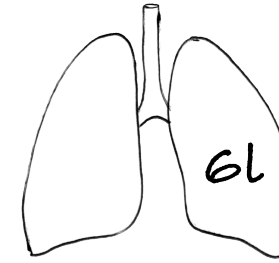


Spitzmaus

120



Ein Ballon, in den 6 Liter  
passen würden ...



Eine Lunge, in die 6 Liter  
passen würden ...

... hätte eine innere Oberfläche von ...

0,16 m<sup>2</sup>

90 m<sup>2</sup>

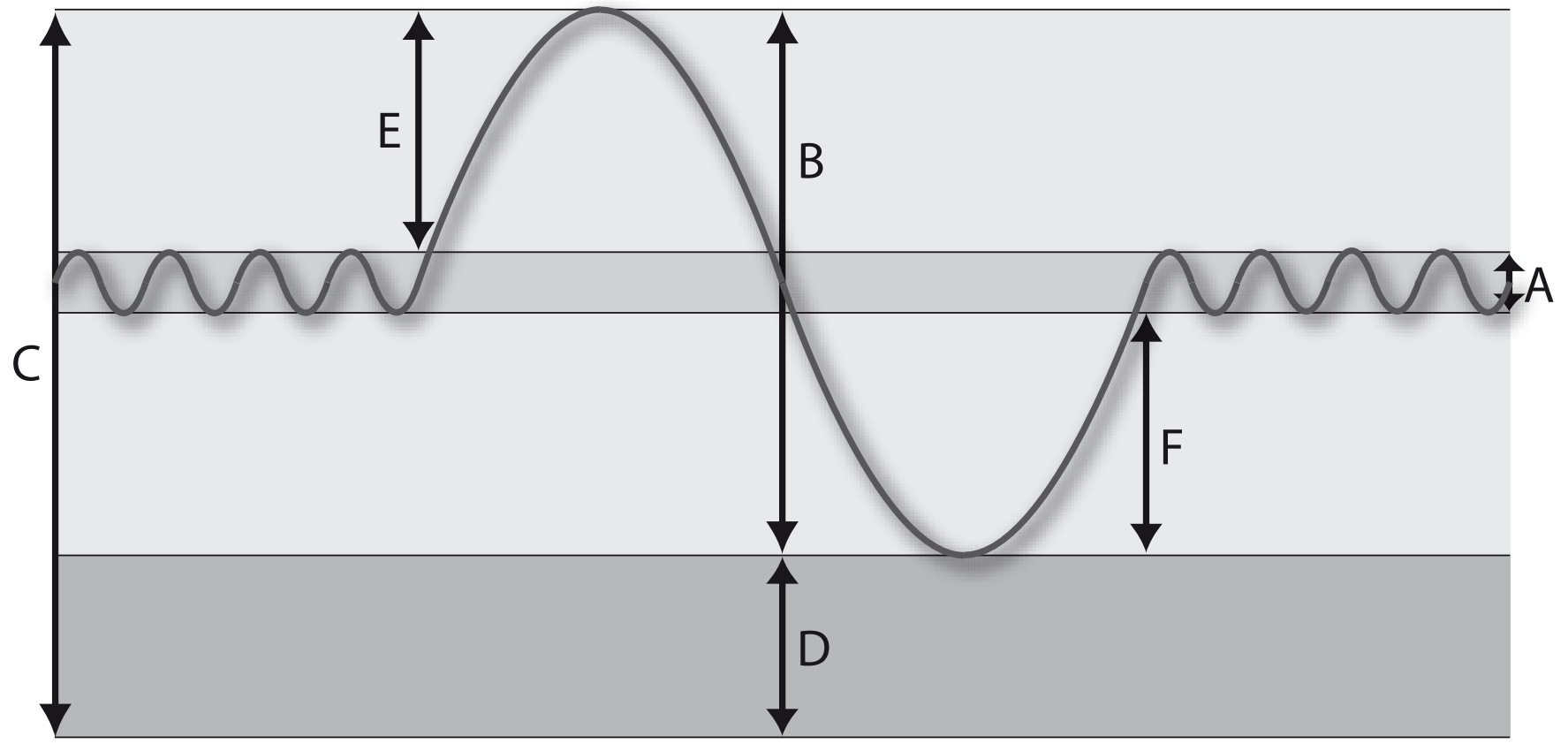
DISKUSSION AUF DEM SCHULHOF...

IN DIE MENSCHLICHE  
LUNGE PASSEN MEHR  
ALS 2 LITER LUFT!

**HMMMMM!**

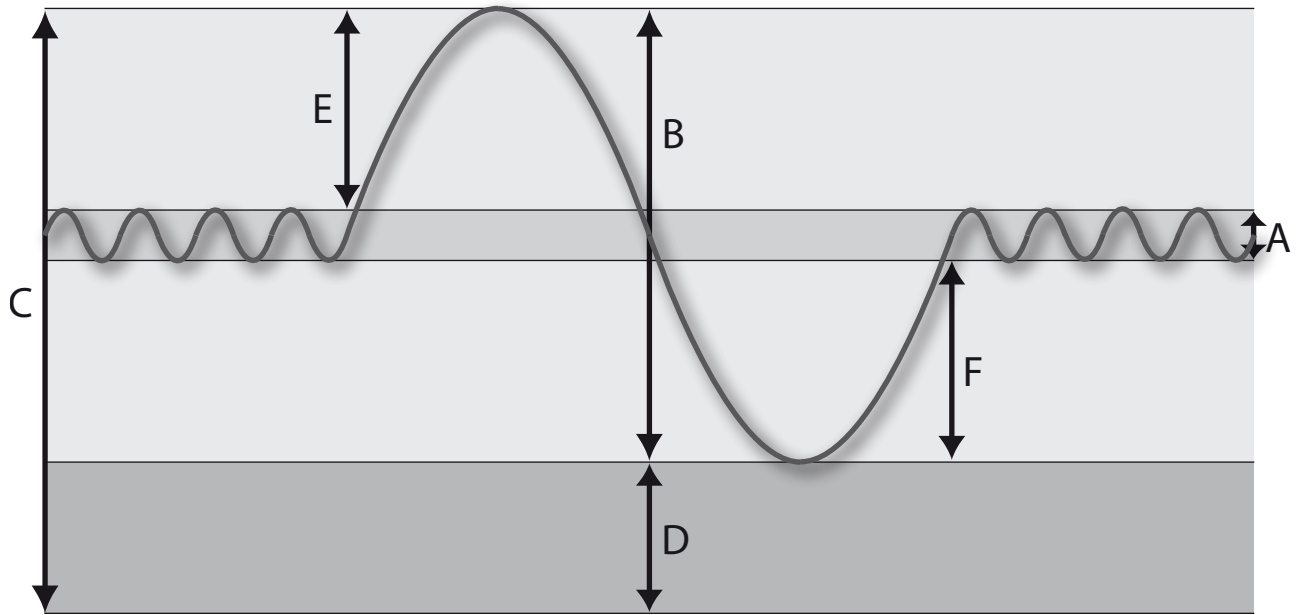
ETWA SO VIEL WIE IN 3  
FLASCHEN MINERALWASSER?

DAS GLAUBE ICH NICHT!  
DAS ERSCHEINT MIR  
DEUTLICH ZU VIEL!



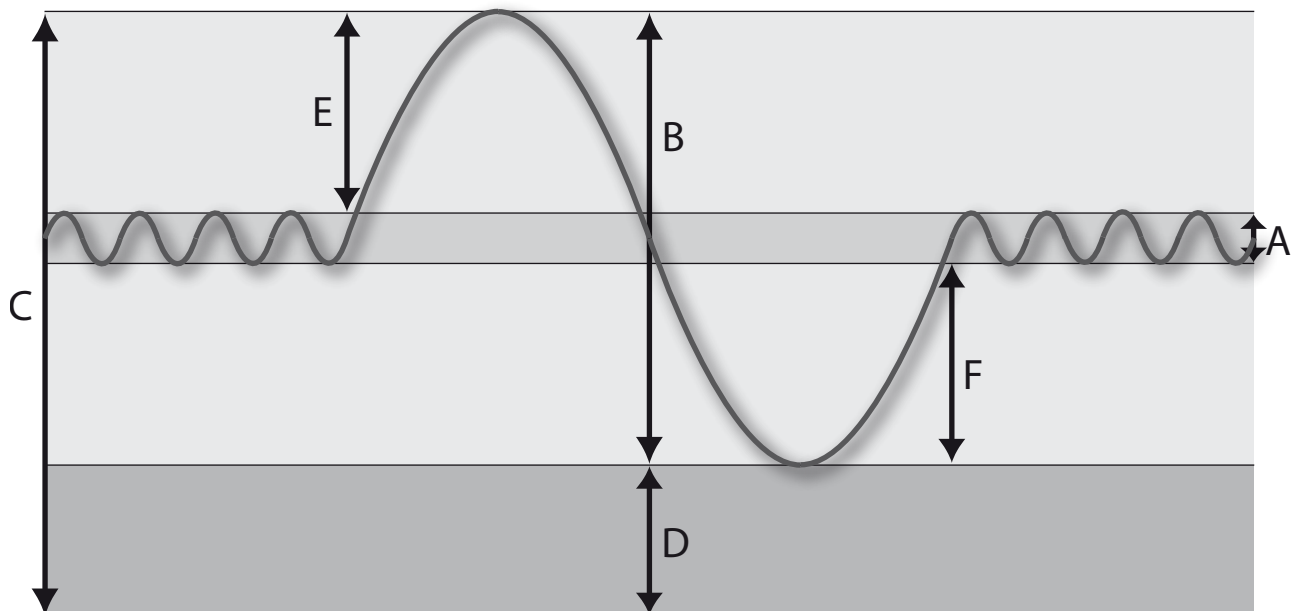


**Aufgabe.** Benenne die unterschiedlichen Lungenvolumina!



A	D
B	E
C	F

**Aufgabe.** Benenne die unterschiedlichen Lungenvolumina!



A	D
B	E
C	F


## Lösung

A Atemzugvolumen	D Restkapazität
B Vitalkapazität	E Maximale Einatemreserve
C Gesamtkapazität	F Maximale Ausatemreserve

WENN ICH EINEN 3 METER  
LANGEN SCHNORCHEL HÄTTE,  
KÖNNTE ICH UNBEGRENZTE  
ZEIT HIER UNTEN BLEIBEN!



**HOW TO  
STOP MOUTH  
BREATHING!**



You can make sure that you breathe through your nose during the day, but one-third of your time you are asleep.

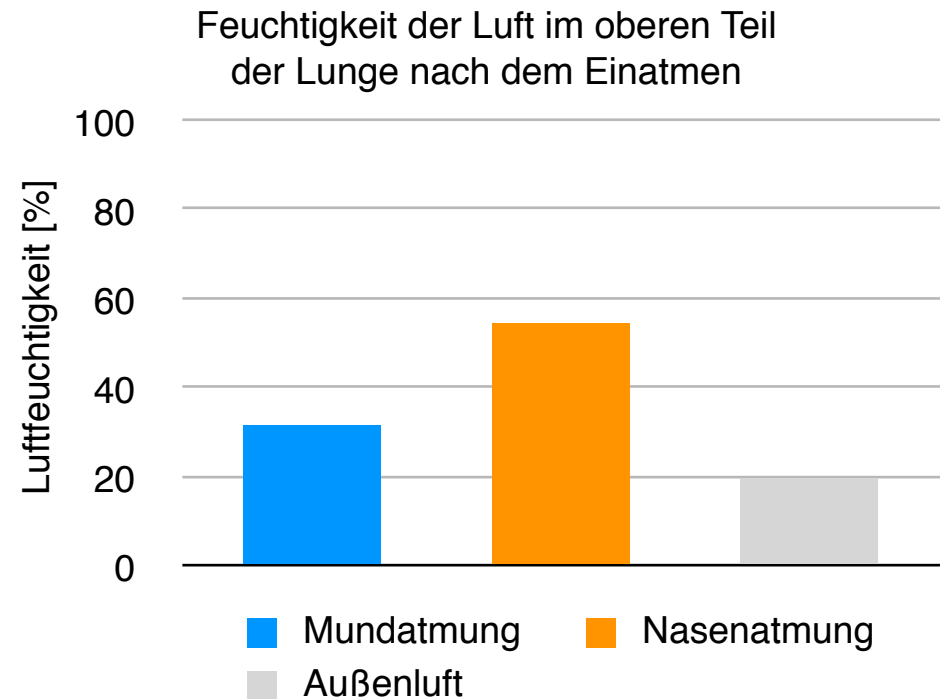
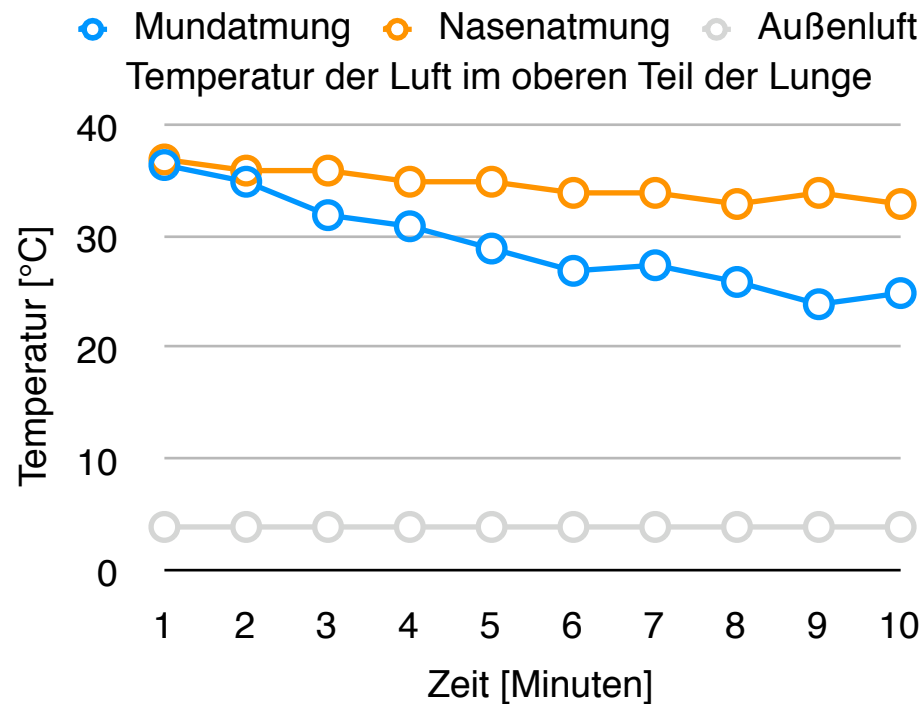
The Davis Chin Supporter stops mouth breathing and thereby prevents snoring, also the various throat and ear troubles directly due to mouth breathing. It's fine mesh canvas or linen fits like a glove and washes like a handkerchief. It will add to your good health and spirits. Measure size around crown of head and point of chin. By mail, postpaid, Cotton—\$2.00, Linen—\$3.00, Mesh—\$4.00.

**CORA M. DAVIS**  
Dept. P. C.      507 Fifth Avenue  
NEW YORK

Aus einer Anzeige der amerikanischen Zeitschrift *Physical Culture* vom März 1922:

*Wie man die Mundatmung stoppt!  
Sie können tagsüber sicherstellen,  
dass sie durch die Nase atmen, aber  
ein Drittel ihrer Zeit schlafen Sie.  
Der Davis-Kinn-Unterstützer stoppt  
die Atmung durch den Mund [...]*





### Was findet sich in Popeln?

- Nasenschleim
- Staubpartikel
- Bakterien
- Blütenpollen

Frage auf einer Beratungsseite im Internet:

### **Störende Nasenhaare**

*Ich habe total viele Nasenhaare. Sind die überhaupt für irgendetwas gut oder kann ich sie entfernen?*

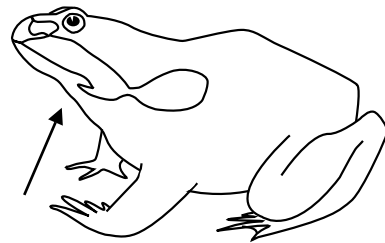
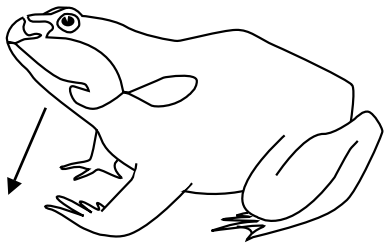
Quelle: <http://www.menshealth.de/style/rasur-enthaarung/stoerende-nasenhaare.16124.htm>

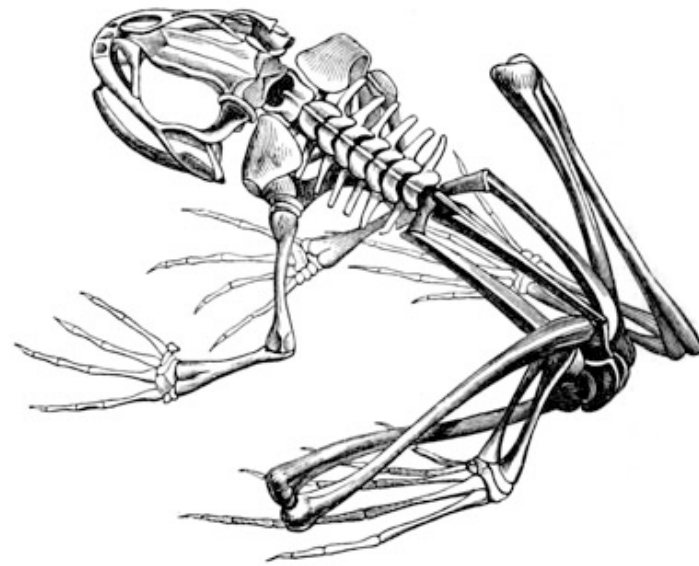
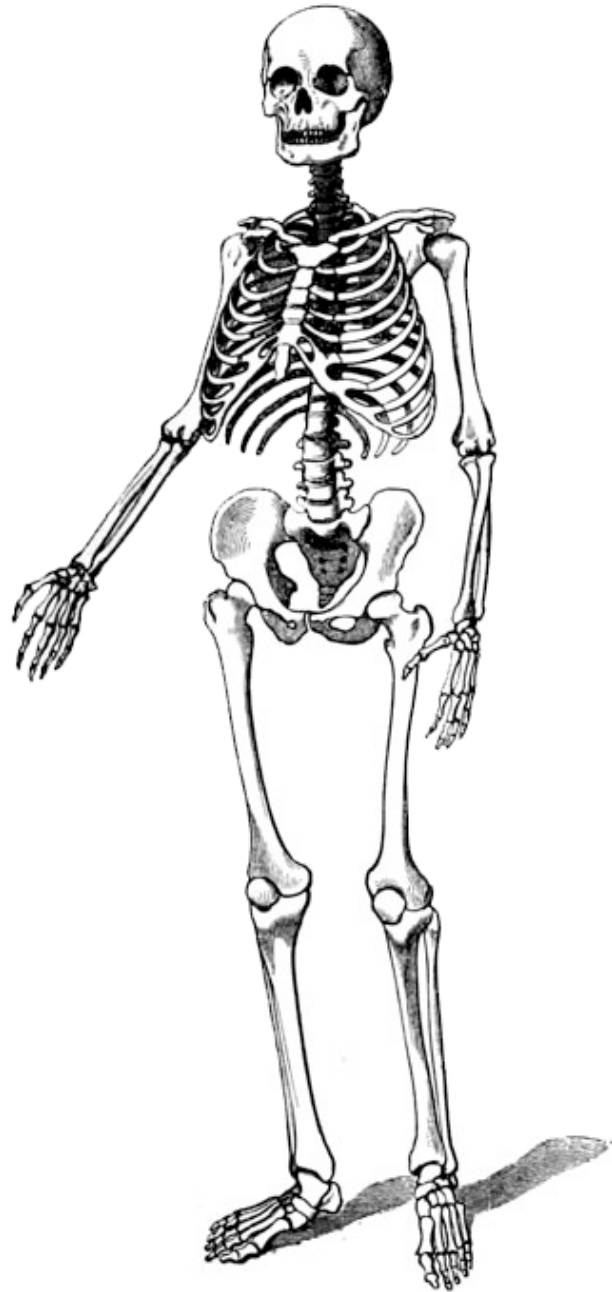


Ein Frosch füllt seine Lungen durch Überdruck.

Zuerst wird der Boden der Mundhöhle abgesenkt, sie vergrößert sich und die Luft strömt wegen des Unterdrucks durch die offenen Nasenlöcher ein.

Dann hebt er bei geschlossenen Nasenlöchern den Boden der Mundhöhle, so wird die Luft durch die Luftröhre in die Lunge gepresst.





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```
with the Invariant Sections being LIST THEIR TITLES, with the
Front-Cover Texts being LIST, and with the Back-Cover Texts being
LIST.
```

If you have Invariant Sections without Cover Texts, or some other combination of the three, merge those two alternatives to suit the situation.

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