

**Comments**  
submitted on behalf  
of  
**Clara L. Lewis Family Trust**  
and  
**Fred Lewis Farm and Mineral Rights Revenue Trust**  
and  
**Lawrence Lewis, individually and as Trustee**

concerning NYSEG

**Seneca West Pipeline Interconnect**  
and  
**The Certificate of Environmental Compatibility and Public Need.**

1. The Stated Purpose of the line is an interconnect to the Seneca Lake Gas Storage Facility. The Seneca Lake Gas Storage Facility has not yet been approved, thereby making this line Speculative and not a necessity.
2. The line is not needed as it appears that NYSEG currently has access to and obtains its gas sources from Dominion Transmission, Inc. by way of an existing pipeline.
3. A portion of the right of way is being obtained from Millennium. No statement or showing has been made that Millennium has agreed to convey an interest sufficient to allow the pipeline, nor has there been a statement or showing that Millennium has an interest which it can convey.
4. The application presents no economic justification for the cost of the pipeline nor for the environmental impact which it will engender.
5. No environmental impact statement has been submitted with the application showing the cumulative impacts of the line and its easement on the environment and land use. The application ignores the thesis set forth in Hardin's seminal work "The Tragedy of the Commons", which sets out the rationale for examining cumulative impacts. A copy of which is attached hereto as Exhibit C.
6. There is no discussion or limitation on pesticide use on the right of way after it has been acquired, and the application specifically requests the right to leave cut trees, cut bushes and other debris from cutting on the right of way without discussing the fire risk to the areas abutting the right of way.
7. The application does not disclose the number of months or years it will take to recover the cost of the right of way and pipeline construction.

8. The application fails to acknowledge that a right of way, being not a fee interest, leaves an panoply of unstated and unidentified obligations between the fee landowner and the applicant as holder of the easement. A list of the unaddressed concerns of the landowner are attached as Exhibit A.

9. The easement is essentially a ground lease for the duration of the pipeline's useful life and should be treated as such with annual payments therefor as it is by the US Bureau of Land Management and by the Tribes in the western part of the United States. There is no justification for why the easement should be perpetual and not limited to the economic life of the pipeline. The perpetual easements are not generally granted anymore by The US Bureau of Land Management nor the Tribes in western United States. Where there is no power of eminent domain, non-perpetual easements based on leasehold principles are the types of legal relationships to which willing landowners and willing companies enter into. (The normal and long accepted definition of 'Fair Market Value'.

10. There is no provision in the application to address the issue of long term financial responsibility of the applicant their assigns or successors to the landowner, owing to the fact that an easement is a continuing relationship between the applicant as Easement holder and the landowner as fee owner.

11. The applicant does not address the impact on the underlying landowner of the following:

1. What happens to the pipe itself when the applicant abandons the easement? Is it removed? If not, why is the landowner left with cost and expense of removal and the liability for its existence?

2. What happens if the applicant files for bankruptcy and the trustee in bankruptcy abandons the easement and the pipeline?

3. Who pays for the removal of the pipe when the easement is abandoned?

4. Who pays for the restoration of the easement area after the pipe is removed at abandonment?

5. Is the construction, restoration, abandonment, removal and restoration bonded?

6. How much insurance is the applicant carrying to cover any suits of which the landowner is made a party because of neglect or other acts of the applicant on the easement?

7. Commercial leases carry a defense, indemnification and hold harmless clause. Where is that included in the application?

8. Why are the terms of the easement not set forth in the application as this is not a fee interest acquisition?

9. How can an applicant ask for the right to take an easement by eminent domain when no terms of the easement are included in the application, an easement being a right of user and not a fee interest in the land? See copy of the model pipeline easement attached at Exhibit B.

12. The comment period is far too short to allow a fair opportunity to examine the application and prepare the necessary comprehensive comments.

13. Any declaration of **Public Need** in which the right of eminent domain would be thereafter be authorized should be preceded by a hearing determining the rights and obligations of the Underlying Landowner and NYSEG during the life of the easement as well as a determination of the duration of the easement other than perpetual. Because the location of the pipeline will be on an easement, NYSEG could at anytime surrender the easement back to the landowner and burden the landowner with the economic and environmental consequences of the removal or of contamination. The economic consequences to the landowner are the cost of removal and restoration thereafter, all of which are unknown. The environmental consequences to the landowner are the risk of contamination of the land from the deterioration and ultimate breakdown of the pipe and the chemical residue left thereby.

Respectfully submitted,

Christopher Denton, Esq.  
Counsel for Clara L. Lewis Family Trust,  
Fred Lewis Farm and Mineral Rights  
Revenue Trust, and Lawrence Lewis,  
individually and as Trustee,  
311 Lake Street  
Elmira, New York 14901  
[attydenton@aol.com](mailto:attydenton@aol.com)  
607-734-0661

## Exhibit A

### Pipeline Easement Minimum Provisions

1. Non-exclusive
2. Non subdividable.
3. Single use.
4. No other uses.
5. No sub-lets.
6. Single pipe diameter.
7. Attorney's fees for Owner of Land only.
8. Water, Soil, and Air Testing
9. Recording of full document.
10. Waiver of eminent domain.
11. Purchase of Gas
12. Reciprocity.
13. No surface rights after construction, except necessary maintenance.
14. Noise standards
15. No compressors.
16. No surveying without permission
17. Access from public roads only or agreed access roads.
18. As build survey to be recorded.
19. Survey pins at boundary lines and all points of azimuth change.
20. Abandonment
21. Damages
22. Reservation of rights
23. Indemnification
24. Insurance
25. Bond
26. Successors and Assigns
27. Construction and Restoration Standards
28. Venue and Applicable Law
29. Waiver of right to use the Federal District Court and right of removal.
30. Severability
31. Bankruptcy
32. Duration
33. Compensation
34. Compliance with Law
35. Testing and Preservation of Data
36. Erosion
37. Health and Safety
38. Landowner's Right of Possession.

39. Temporary Easement Areas
40. Valuation on a per linear foot basis plus damages.
41. Value as a commercial conduit. Rental and Annual Payments.

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**Exhibit B**

Town of \_\_\_\_\_, tax parcel # \_\_\_\_\_  
County of \_\_\_\_\_

**PIPELINE EASEMENT**

THIS AGREEMENT is made this \_\_\_\_\_ day of \_\_\_\_\_, 2011, being the effective beginning date of this easement, between \_\_\_\_\_, their heirs and assigns, whose address is \_\_\_\_\_, Grantor, (hereafter "Landowner" ) and \_\_\_\_\_ a limited liability company under the laws of the State of \_\_\_\_\_, with its principal place of business at \_\_\_\_\_, its successors and assigns, Grantee (hereafter "Grantee").

**WITNESSETH**

In consideration of the payment to the Landowner of the sum of One Dollar (\$1.00 ) and other good and valuable consideration, Landowner hereby grants to Grantee, its successors, and assigns, a non-exclusive, non-subdividable, easement as described and circumscribed herein for the purpose:

1. to construct, operate, inspect, maintain, repair, and remove a single natural gas gathering pipeline, \_\_\_\_\_ inches in diameter, to run down the center of the easement, for transporting gas;
2. to perform pre-construction work under, on, across and through the easement; and
3. for ingress to and egress from the easement area via the easement and by means of existing or future public roads crossing the easement.

Landowner's property is situate in the Town of \_\_\_\_\_, County of \_\_\_\_\_, New York, as more particularly described in that certain deed dated \_\_\_\_\_, recorded in the County Clerk's Office at Liber \_\_\_\_\_ of Deeds at Page \_\_\_\_\_, and incorporated herein by reference for a more particular description of said property, but this easement is limited and confined to the instrument survey map attached hereto and made a part hereof.

Property tax or permanent parcel identification numbers: \_\_\_\_\_, Town of \_\_\_\_\_

PERMANENT EASEMENT AREA: The easement area shall be a strip of land as shown on the attached survey map, fifteen feet wide, no deeper than ten feet in depth and with a length and location as shown on the said map. Upon completion of the initial construction, and as a condition of this easement, the Grantee shall record in the \_\_\_\_\_ County Clerk's office an "as built", metes and bounds, instrument survey, showing clearly the centerline of the pipeline, and showing pins at all points of any course changes and where the easement intersects with the boundary of any other parcel of property, and/or any right of way, including roads, power lines, communication lines and the like, and such recording shall be cross referenced to this easement, matching the map attached hereto.

TEMPORARY CONSTRUCTION EASEMENT: In addition to the permanent easement area as defined above, Landowner grants Grantee a temporary easement defined as \_\_\_\_\_ feet on each side of and adjacent to the permanent pipeline easement as shown on the above referenced survey map to initially construct the pipeline in the conduct of all activities incident to said initial construction thereto, including restoration or clean-up activities. When the temporary construction easement is utilized, the Grantee shall pay for damage as set out in the paragraph below entitled "DAMAGES." Said temporary easement shall expire 12 months after the commencement of the construction of the pipeline unless extended in writing by the Grantor.

LANDOWNER'S RIGHT OF POSSESSION: The top of the pipeline, including all systems which are part of it and other appurtenances reasonably required, shall be buried at least four feet below the surface of the land, and at least five feet below the surface of farm and logging access roads or log skidding and landing areas. Landowner shall not materially change the depth of cover over the easement area as defined above of the installed pipeline without the written consent of the Grantee and shall not place or permit to be placed any temporary or permanent structure of any kind, including but not limited to buildings, mobile homes, trees, paved roads or the like on or over the easement area of any installed pipeline, and shall not store any materials of any kind on the easement area. If not stated herein the Grantor shall have no restriction of its activities within the easement area or Grantor's remaining lands unless the Grantor shall be paid additional compensation, to which Grantor then agrees, for the loss of the right to engage in such activities. Grantee acknowledges that the Grantor may actively operate a farm on the premises and that Grantee shall bury the pipeline of sufficient depth that the Grantor his heirs, successors and assigns will not be restricted in the weight of machinery crossing the pipeline. Upon the request of the Grantor, prior to the commencement of construction, the Grantee shall include and shall construct at least one heavy weight crossing of the pipeline for every one thousand feet of pipeline on the property.

TESTING AND PRESERVATION OF DATA: Prior to the commencement of any activities on the site of the easement, the Grantee shall complete a soil survey, including tests for types, depth, fertility, ph and such other values as the Grantor may reasonably require after consultation with a qualified expert, a contour survey, and a hydrology survey of the movement of water in and over the ground at the entire site. Grantee shall also conduct pre- and post-construction (within two months of completion of construction work restoration) testing of air, water, streams, ponds, and springs and other water sources on the premises. Grantee shall be strictly liable for any diminution of the quality

or quantity of air, soil, water, water wells, streams, ponds, springs, aquifers or water sources becoming apparent at any time during or after construction of the pipeline or any work thereon at any time. If the testing required herein is not performed then any adverse air or water quality or quantity shall be irrebuttably presumed to have been caused by the Grantee. Photographs and video, showing the date and time of their taking, shall be made in detail of the entire site before, during and after construction, and shall be stored by the Grantee, with copies delivered to the Grantor concurrently, to assure that the site is restored to its former condition under the terms of this easement. Failure by the Grantee to perform under the terms of this paragraph shall increase the annual rent by 100 % over its then current amount and such increase shall not diminish nor limit any other remedies available to Grantor by law.

**EROSION:** Temporary erosion controls shall be installed and maintained before and during any disturbance of soil. All erosion controls and devices will comply with the highest standard of construction site erosion control regulations of Federal and State of New York regulatory agencies, regardless of whether specifically made applicable to construction, maintenance or operation of a pipeline easement. Temporary diversions shall be maintained during the construction phase and inspected on a regular basis to ensure proper functioning. Any devices damaged will be repaired promptly.

**ABANDONMENT:** In the event that the Grantee, or its successors or assigns, abandons the pipeline or the easement, this Agreement shall terminate and Grantee shall have no further rights hereunder, but shall have the continuing obligations as set forth herein. If either the pipeline or the easement is abandoned, then both shall be deemed abandoned. Unless agreed in writing by the Lessor or Grantor, no pipelines shall be abandoned in place, but shall be removed and properly disposed of offsite with the property restored to a condition at least equal to its condition prior to the installation of the pipeline.

**RESERVATION OF RIGHTS:** Grantor forever reserves any present or future statutory, regulatory, judicial or contractual right which Grantor has or may have to receive gas service from any pipeline laid pursuant to this agreement and, further, Grantor forever preserves its right against Grantee for any present or future statutory, regulatory, judicial or contractual obligation, Grantee has, or may have, to provide natural gas service from any of Grantee's pipelines to any and all improvements now or later on Grantor's property described above.

**DAMAGES:** Grantee agrees to restore and repair any damage to fences, tile drains, drainage, hydrology, timber, crops, habitat, and any improvements and the like caused by the activities conducted pursuant to this easement, or at the election of the Grantor, the Grantee shall pay for the damages thereof, which damages shall include the actual and complete cost of replacement and installation of all property damaged and the loss of their use, as well as consequential and incidental damages. Grantee shall pay the cost of Grantor's attorney fees, expert witnesses, and court costs and fees, if Grantor prevails in any suit to determine and to recover payment for such damages or to enforce the restoration and repair of the area and items damaged. Grantor shall have the continuing right to use the easement area for the growing of crops or as a cultivated wildlife meadow, but the Grantee shall have the right, without additional compensation to the Grantor, to keep the easement clear of all trees and brush, but by cutting only. Grantee shall

remove or leave on site the cuttings at the direction of the Grantor. Grantee acknowledges that the damages which may arise from the failure of the Grantee to perform its obligations may cause damages for which restoration is required. In such circumstances the Grantor shall have the option of receiving a mutually agreed upon amount of money for the damages or electing to require that the Grantee take all possible measures, regardless of the cost, to completely repair or restore the property damaged. This paragraph shall survive the termination, expiration, or surrender of this Easement.

**INDEMNITY:** Grantee shall indemnify, defend and hold harmless the Landowner, its successors and assigns from and against any and all losses, claims, demands, suits, judgments, fines or penalties, which accrue or arise from the negligence or willful misconduct of Grantee, its invitees, its contractors, sub-contractors, employees and agents in their conduct in any way, directly or indirectly, relating to the easement. This paragraph shall survive the termination, expiration, or surrender of this Easement.

**INSURANCE:** The Grantee shall maintain insurance on the pipeline and the easement premises during the life of this easement and continuously thereafter until the pipeline is properly removed or abandoned and disabled in compliance with the terms of this easement. Said insurance shall name the Grantor as additional insured and shall maintain coverage for liability in an amount of at least \$10,000,000.00 for personal injury and property damage per occurrence. Failure by Grantee to provide certificates of insurance within thirty days of demand shall be grounds for forfeiture of this Easement.

**BOND:** The Grantee, before construction begins and during construction and restoration shall post a performance bond in the amount of three times the cost of construction and restoration of the pipeline, including the removal of the pipeline and restoration thereafter, to insure that such construction and restoration are carried out in compliance with the terms of this Easement. Failure by Grantee to provide certificates from the bonding company within thirty days of demand shall be grounds for forfeiture of this Easement.

**TIMBER AND BIOTA:** The Grantee shall pay to the Grantor, as additional compensation, the full fair market value of all timber and wood located on the easement and cut therefrom, but the title and possession of said timber and wood shall remain in the Grantor to dispose of or sell and to retain the proceeds as Grantor's. If Grantor's agent or contractor does not cut the timber and wood, Grantee agrees that it shall cut, stack and place the timber on a site designated by the Grantor and shall do so at Grantee's sole expense and pursuant to the direction of the Grantor's forester in such a manner as to not damage the market value of the timber. All timber shall be harvested under the supervision of a professional forester hired and paid by the Grantor. All stumps shall be disposed of in a manner required by Grantor's forester and at the sole expense of the Grantee. Grantee shall not use or apply, directly or indirectly, itself or through its agents or subcontractors nor allow the application of any pesticides, herbicides, biocides or other such poisons onto the easement area. At the completion of construction as well as any land-disturbing maintenance of the pipeline, the land shall be restored within three months to its full crop productive soil capability through the implementation, at Lessee's expense, of the NYS Department of Agriculture and Markets "Pipeline Right-of Way Construction Projects Mitigation

Plan”, Rev 11-97. Failure by the Grantee to perform under the terms of this paragraph shall cause the Grantee to lose its right to put and or transmit gas through said pipeline until this paragraph has been complied with.

**NOISE STANDARDS:** Before any construction of any facilities on the premises (if allowed by this Easement) or in any oil or gas unit of which the premises are a part, a plan of noise abatement shall be approved by the Grantor, which plan shall include a limit on noise to 20 decibels at 50 feet from any facility (including but not limited to compressors) as well as a comprehensive plan, approved by the Grantor, to address and limit high and low frequency noise emissions from any improvements on the premises or in any oil or gas unit of which the premises have been made a part. The compressor area, if allowed, shall comply with a separate surface rights agreement which must be in place before any surface use of the easement area is used. No surface use of the easement area shall be allowed without a separate surface rights agreement.

**SUCCESSORS:** All rights and duties under this Agreement shall benefit and bind Landowner and Grantee and their respective heirs, successors and assigns. This easement shall be and is indivisible by Grantee but not Grantor; and any assignment thereof by Grantee shall be of the whole amount only; and upon assignment by Grantee, all assignees and the Grantee shall become jointly and severally liable, and such assignment shall not relieve the Grantee of its obligations hereunder. Grantor reserves the exclusive right to grant additional easements of any kind or nature to others over the easement area so long as such grant does not violate state or federal law and does not materially interfere with the operations of the Grantee’s use of the easement herein.

**COMPLIANCE WITH LAW:** The grantee, its successors and assigns shall at all times comply with all local, state and federal laws including but not limited to those applicable to the environment, employment, labor relations, insurance, the land, the air, the water, and to pipelines. Failure to comply with any provision of this easement shall be grounds for forfeiture if the Grantee, its successors and assigns fails to cure said failure within 10 days of its occurrence or knowledge thereof, whichever is later.

**CONSTRUCTION AND RESTORATION SPECIFICATIONS:** The Grantee shall construct and maintain the pipeline herein under a plan which shall meet or exceed the provisions set forth in NYS Department of Public Service Official Publication entitled Environmental Management and Construction Standards and Practices for Underground Transmission and Distribution Facilities in New York State, rev Feb 28, 2006, and for farmlands, in addition to the aforereferenced publication, the NYS Department of Agriculture and Markets Official Publication entitled “Pipeline Right-of Way Construction Projects, Agricultural Mitigation Through the Stages of Project Planning, Construction/Restoration and Follow-up Monitoring ”, Rev 11-97 shall apply.

**EMINENT DOMAIN:** The Grantee, its successors and assigns, their agents, directors, shareholders, members, joint venturers, partners, subcontractors, or employees agree to never employ, use, agree to, acquiesce in or facilitate, directly or indirectly, the right of eminent domain in order to obtain from the Grantor any oil and gas rights or storage rights on or under the

premises nor to acquire any pipeline or other easements or rights of way. This paragraph shall survive the termination, expiration, or surrender of this Easement.

**VENUE AND APPLICABLE LAW:** The easement shall be governed by the laws of the State of New York, except that all actions and proceedings or any other application for relief shall be brought in the Supreme Court of New York State in and for the County in which the premises is located, and the Grantor shall be entitled to jury trial thereon. The Grantee agrees that no action or proceeding shall be removed to Federal District Court of the United States of America unless the Grantor has separately and expressly agreed in writing.

**BANKRUPTCY:** In the event that the Grantee shall file for protection from its creditors under the laws of the United States, the State of New York, or any jurisdiction, foreign or domestic then this easement shall become void. But the Grantee, with the supervision of a court of proper jurisdiction, and properly bonded and insured, may enter onto the easement to complete its abandonment.

**DURATION:** This easement shall last for only so long as the easement is actively used for the purpose described above, without abandonment, but in no case longer than 20 years. The purpose shall be limited to use as a natural gas connector pursuant to the Certificate of Environmental Compatibility and Public Need issued currently with the granting of this easement.

**ANNUAL COMPENSATION:** The Grantee shall pay to the Grantor an annual rental .

**PARTIES:** The easement shall run to the benefit of the parties, their heirs, successors and assigns. The use of the word Grantor or Grantee shall in all cases include the their heirs, successors, and assigns. This Easement shall not be effective unless signed by all parties to it.

**DUE AUTHORITY:** The Grantee herein hereby affirms under penalty of perjury that it has due authority to enter into this lease, that the signer has obtained the permission and authority to sign on behalf of whomever he or she is signing, and that the signing and performance contemplated by and under this lease does not violate any law under which it is organized, any certificate of incorporation, by-law, organizing document, operating agreement, or contract affecting the Grantee.

To have and to hold the easement herein granted unto the Grantee, its heirs, successors and assigns of the party of the second part forever.

IN WITNESS WHEREOF, the Grantor and Grantee have duly executed this easement the day and year first above written.

\_\_\_\_\_

By:

Its: \_\_\_\_\_

Grantee

\_\_\_\_\_

Grantor

\_\_\_\_\_

Grantor

State of New York )

: ss

County of \_\_\_\_\_ )

On the \_\_\_\_ day of \_\_\_\_\_ in the year 2011 before me, the undersigned, personally appeared \_\_\_\_\_ personally known to me or proved to me on the basis of satisfactory evidence to be the individuals whose names are subscribed to the within instrument and acknowledged to me that they executed the same in their capacities, and that by their signatures on the instrument, the individuals, or the person upon behalf of which the individuals acted, executed the instrument.

\_\_\_\_\_

Notary Public

My Commission Expires:

State of \_\_\_\_\_ )

County of \_\_\_\_\_ )

On the \_\_\_\_ day of \_\_\_\_\_ in the year 2011 before me, the undersigned, personally appeared \_\_\_\_\_ personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her capacity, and that by his/her signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

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Notary Public  
My Commission Expires:

State of \_\_\_\_\_ )  
County of \_\_\_\_\_ )

On the \_\_\_\_ day of \_\_\_\_\_ in the year 2011 before me, the undersigned,  
personally appeared \_\_\_\_\_ personally known to me or proved  
to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the  
within instrument and acknowledged to me that he/she executed the same in his/her capacity, and  
that by his/her signature on the instrument, the individual, or the person upon behalf of which the  
individual acted, executed the instrument.

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Notary Public  
My Commission Expires:

## Exhibit C

# The Tragedy of the Commons

Garrett Hardin (1968)

1. "The Tragedy of the Commons," Garrett Hardin, *Science*, 162(1968):1243-1248.

At the end of a thoughtful article on the future of nuclear war, J.B. Wiesner and H.F. York concluded that: "Both sides in the arms race are...confronted by the dilemma of steadily increasing military power and steadily decreasing national security. *It is our considered professional judgment that this dilemma has no technical solution.* If the great powers continue to look for solutions in the area of science and technology only, the result will be to worsen the situation." [1]

I would like to focus your attention not on the subject of the article (national security in a nuclear world) but on the kind of conclusion they reached, namely that there is no technical solution to the problem. An implicit and almost universal assumption of discussions published in professional and semipopular scientific journals is that the problem under discussion has a technical solution. A technical solution may be defined as one that requires a change only in the techniques of the natural sciences, demanding little or nothing in the way of change in human values or ideas of morality.

In our day (though not in earlier times) technical solutions are always welcome. Because of previous failures in prophecy, it takes courage to assert that a desired technical solution is not possible. Wiesner and York exhibited this courage; publishing in a science journal, they insisted that the solution to the problem was not to be found in the natural sciences. They cautiously qualified their statement with the phrase, "It is our considered professional judgment...." Whether they were right or not is not the concern of the present article. Rather, the concern here is with the important concept of a class of human problems which can be called "no technical solution problems," and more specifically, with the identification and discussion of one of these.

It is easy to show that the class is not a null class. Recall the game of tick-tack-toe. Consider the problem, "How can I win the game of tick-tack-toe?" It is well known that I cannot, if I assume (in keeping with the conventions of game theory) that my opponent understands the game perfectly. Put another way, there is no "technical solution" to the problem. I can win only by giving a radical meaning to the word "win." I can hit my opponent over the head; or I can falsify the records. Every way in which I "win" involves, in some sense, an abandonment of the game, as we intuitively understand it. (I can also, of course, openly abandon the game -- refuse to play it. This is what most adults do.)

The class of "no technical solution problems" has members. My thesis is that the "population problem," as conventionally conceived, is a member of this class. How it is conventionally conceived needs some comment. It is fair to say that most people who anguish over the population problem are trying to find a way to avoid the evils of overpopulation without relinquishing any of the privileges they now enjoy. They think that farming the seas or developing new strains of wheat will solve the problem -- technologically. I try to show here that

the solution they seek cannot be found. The population problem cannot be solved in a technical way, any more than can the problem of winning the game of tick-tack-toe.

## What Shall We Maximize?

Population, as Malthus said, naturally tends to grow "geometrically," or, as we would now say, exponentially. In a finite world this means that the per-capita share of the world's goods must decrease. Is ours a finite world?

A fair defense can be put forward for the view that the world is infinite or that we do not know that it is not. But, in terms of the practical problems that we must face in the next few generations with the foreseeable technology, it is clear that we will greatly increase human misery if we do not, during the immediate future, assume that the world available to the terrestrial human population is finite. "Space" is no escape. [2]

A finite world can support only a finite population; therefore, population growth must eventually equal zero. (The case of perpetual wide fluctuations above and below zero is a trivial variant that need not be discussed.) When this condition is met, what will be the situation of mankind? Specifically, can Bentham's goal of "the greatest good for the greatest number" be realized?

No -- for two reasons, each sufficient by itself. The first is a theoretical one. It is not mathematically possible to maximize for two (or more) variables at the same time. This was clearly stated by von Neumann and Morgenstern, [3] but the principle is implicit in the theory of partial differential equations, dating back at least to D'Alembert (1717-1783).

The second reason springs directly from biological facts. To live, any organism must have a source of energy (for example, food). This energy is utilized for two purposes: mere maintenance and work. For man maintenance of life requires about 1600 kilocalories a day ("maintenance calories"). Anything that he does over and above merely staying alive will be defined as work, and is supported by "work calories" which he takes in. Work calories are used not only for what we call work in common speech; they are also required for all forms of enjoyment, from swimming and automobile racing to playing music and writing poetry. If our goal is to maximize population it is obvious what we must do: We must make the work calories per person approach as close to zero as possible. No gourmet meals, no vacations, no sports, no music, no literature, no art...I think that everyone will grant, without argument or proof, that maximizing population does not maximize goods. Bentham's goal is impossible.

In reaching this conclusion I have made the usual assumption that it is the acquisition of energy that is the problem. The appearance of atomic energy has led some to question this assumption. However, given an infinite source of energy, population growth still produces an inescapable problem. The problem of the acquisition of energy is replaced by the problem of its dissipation, as J. H. Fremlin has so wittily shown. [4] The arithmetic signs in the analysis are, as it were, reversed; but Bentham's goal is unobtainable.

The optimum population is, then, less than the maximum. The difficulty of defining the optimum is enormous; so far as I know, no one has seriously tackled this problem. Reaching an acceptable and stable solution will surely require more than one generation of hard analytical work -- and

much persuasion.

We want the maximum good per person; but what is good? To one person it is wilderness, to another it is ski lodges for thousands. To one it is estuaries to nourish ducks for hunters to shoot; to another it is factory land. Comparing one good with another is, we usually say, impossible because goods are incommensurable. Incommensurables cannot be compared.

Theoretically this may be true; but in real life incommensurables *are* commensurable. Only a criterion of judgment and a system of weighting are needed. In nature the criterion is survival. Is it better for a species to be small and hideable, or large and powerful? Natural selection commensurates the incommensurables. The compromise achieved depends on a natural weighting of the values of the variables.

Man must imitate this process. There is no doubt that in fact he already does, but unconsciously. It is when the hidden decisions are made explicit that the arguments begin. The problem for the years ahead is to work out an acceptable theory of weighting. Synergistic effects, nonlinear variation, and difficulties in discounting the future make the intellectual problem difficult, but not (in principle) insoluble.

Has any cultural group solved this practical problem at the present time, even on an intuitive level? One simple fact proves that none has: there is no prosperous population in the world today that has, and has had for some time, a growth rate of zero. Any people that has intuitively identified its optimum point will soon reach it, after which its growth rate becomes and remains zero.

Of course, a positive growth rate might be taken as evidence that a population is below its optimum. However, by any reasonable standards, the most rapidly growing populations on earth today are (in general) the most miserable. This association (which need not be invariable) casts doubt on the optimistic assumption that the positive growth rate of a population is evidence that it has yet to reach its optimum.

We can make little progress in working toward optimum population size until we explicitly exorcise the spirit of Adam Smith in the field of practical demography. In economic affairs, *The Wealth of Nations* (1776) popularized the "invisible hand," the idea that an individual who "intends only his own gain," is, as it were, "led by an invisible hand to promote...the public interest." [5] Adam Smith did not assert that this was invariably true, and perhaps neither did any of his followers. But he contributed to a dominant tendency of thought that has ever since interfered with positive action based on rational analysis, namely, the tendency to assume that decisions reached individually will, in fact, be the best decisions for an entire society. If this assumption is correct it justifies the continuance of our present policy of *laissez faire* in reproduction. If it is correct we can assume that men will control their individual fecundity so as to produce the optimum population. If the assumption is not correct, we need to reexamine our individual freedoms to see which ones are defensible.

## **Tragedy of Freedom in a Commons**

The rebuttal to the invisible hand in population control is to be found in a scenario first sketched

in a little-known Pamphlet in 1833 by a mathematical amateur named William Forster Lloyd (1794-1852). [6] We may well call it "the tragedy of the commons," using the word "tragedy" as the philosopher Whitehead used it [7]: "The essence of dramatic tragedy is not unhappiness. It resides in the solemnity of the remorseless working of things." He then goes on to say, "This inevitableness of destiny can only be illustrated in terms of human life by incidents which in fact involve unhappiness. For it is only by them that the futility of escape can be made evident in the drama."

The tragedy of the commons develops in this way. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy.

As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, "What is the utility *to me* of adding one more animal to my herd?" This utility has one negative and one positive component.

1. The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly + 1.
2. The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsmen, the negative utility for any particular decision-making herdsman is only a fraction of - 1.

Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another.... But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit -- in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.

Some would say that this is a platitude. Would that it were! In a sense, it was learned thousands of years ago, but natural selection favors the forces of psychological denial. [8] The individual benefits as an individual from his ability to deny the truth even though society as a whole, of which he is a part, suffers. Education can counteract the natural tendency to do the wrong thing, but the inexorable succession of generations requires that the basis for this knowledge be constantly refreshed.

A simple incident that occurred a few years ago in Leominster, Massachusetts shows how perishable the knowledge is. During the Christmas shopping season the parking meters downtown were covered with plastic bags that bore tags reading: "Do not open until after Christmas. Free parking courtesy of the mayor and city council." In other words, facing the prospect of an increased demand for already scarce space, the city fathers reinstated the system

of the commons. (Cynically, we suspect that they gained more votes than they lost by this retrogressive act.)

In an approximate way, the logic of the commons has been understood for a long time, perhaps since the discovery of agriculture or the invention of private property in real estate. But it is understood mostly only in special cases which are not sufficiently generalized. Even at this late date, cattlemen leasing national land on the Western ranges demonstrate no more than an ambivalent understanding, in constantly pressuring federal authorities to increase the head count to the point where overgrazing produces erosion and weed-dominance. Likewise, the oceans of the world continue to suffer from the survival of the philosophy of the commons. Maritime nations still respond automatically to the shibboleth of the "freedom of the seas." Professing to believe in the "inexhaustible resources of the oceans," they bring species after species of fish and whales closer to extinction. [9]

The National Parks present another instance of the working out of the tragedy of the commons. At present, they are open to all, without limit. The parks themselves are limited in extent -- there is only one Yosemite Valley -- whereas population seems to grow without limit. The values that visitors seek in the parks are steadily eroded. Plainly, we must soon cease to treat the parks as commons or they will be of no value to anyone.

What shall we do? We have several options. We might sell them off as private property. We might keep them as public property, but allocate the right to enter them. The allocation might be on the basis of wealth, by the use of an auction system. It might be on the basis of merit, as defined by some agreed-upon standards. It might be by lottery. Or it might be on a first-come, first-served basis, administered to long queues. These, I think, are all objectionable. But we must choose -- or acquiesce in the destruction of the commons that we call our National Parks.

## **Pollution**

In a reverse way, the tragedy of the commons reappears in problems of pollution. Here it is not a question of taking something out of the commons, but of putting something in -- sewage, or chemical, radioactive, and heat wastes into water; noxious and dangerous fumes into the air; and distracting and unpleasant advertising signs into the line of sight. The calculations of utility are much the same as before. The rational man finds that his share of the cost of the wastes he discharges into the commons is less than the cost of purifying his wastes before releasing them. Since this is true for everyone, we are locked into a system of "fouling our own nest," so long as we behave only as independent, rational, free enterprisers.

The tragedy of the commons as a food basket is averted by private property, or something formally like it. But the air and waters surrounding us cannot readily be fenced, and so the tragedy of the commons as a cesspool must be prevented by different means, by coercive laws or taxing devices that make it cheaper for the polluter to treat his pollutants than to discharge them untreated. We have not progressed as far with the solution of this problem as we have with the first. Indeed, our particular concept of private property, which deters us from exhausting the positive resources of the earth, favors pollution. The owner of a factory on the bank of a stream -- whose property extends to the middle of the stream -- often has difficulty seeing why it is not his natural right to muddy the waters flowing past his door. The law, always behind the times,

requires elaborate stitching and fitting to adapt it to this newly perceived aspect of the commons.

The pollution problem is a consequence of population. It did not much matter how a lonely American frontiersman disposed of his waste. "Flowing water purifies itself every ten miles," my grandfather used to say, and the myth was near enough to the truth when he was a boy, for there were not too many people. But as population became denser, the natural chemical and biological recycling processes became overloaded, calling for a redefinition of property rights.

## How to Legislate Temperance?

Analysis of the pollution problem as a function of population density uncovers a not generally recognized principle of morality, namely: *the morality of an act is a function of the state of the system at the time it is performed.* [10] Using the commons as a cesspool does not harm the general public under frontier conditions, because there is no public; the same behavior in a metropolis is unbearable. A hundred and fifty years ago a plainsman could kill an American bison, cut out only the tongue for his dinner, and discard the rest of the animal. He was not in any important sense being wasteful. Today, with only a few thousand bison left, we would be appalled at such behavior.

In passing, it is worth noting that the morality of an act cannot be determined from a photograph. One does not know whether a man killing an elephant or setting fire to the grassland is harming others until one knows the total system in which his act appears. "One picture is worth a thousand words," said an ancient Chinese; but it may take ten thousand words to validate it. It is as tempting to ecologists as it is to reformers in general to try to persuade others by way of the photographic shortcut. But the essence of an argument cannot be photographed: it must be presented rationally -- in words.

That morality is system-sensitive escaped the attention of most codifiers of ethics in the past. "Thou shalt not..." is the form of traditional ethical directives which make no allowance for particular circumstances. The laws of our society follow the pattern of ancient ethics, and therefore are poorly suited to governing a complex, crowded, changeable world. Our epicyclic solution is to augment statutory law with administrative law. Since it is practically impossible to spell out all the conditions under which it is safe to burn trash in the back yard or to run an automobile without smog-control, by law we delegate the details to bureaus. The result is administrative law, which is rightly feared for an ancient reason -- *Quis custodiet ipsos custodes?* -- Who shall watch the watchers themselves? John Adams said that we must have a "government of laws and not men." Bureau administrators, trying to evaluate the morality of acts in the total system, are singularly liable to corruption, producing a government by men, not laws.

Prohibition is easy to legislate (though not necessarily to enforce); but how do we legislate temperance? Experience indicates that it can be accomplished best through the mediation of administrative law. We limit possibilities unnecessarily if we suppose that the sentiment of *Quis custodiet* denies us the use of administrative law. We should rather retain the phrase as a perpetual reminder of fearful dangers we cannot avoid. The great challenge facing us now is to invent the corrective feedbacks that are needed to keep custodians honest. We must find ways to legitimate the needed authority of both the custodians and the corrective feedbacks.

## Freedom to Breed Is Intolerable

The tragedy of the commons is involved in population problems in another way. In a world governed solely by the principle of "dog eat dog" --if indeed there ever was such a world--how many children a family had would not be a matter of public concern. Parents who bred too exuberantly would leave fewer descendants, not more, because they would be unable to care adequately for their children. David Lack and others have found that such a negative feedback demonstrably controls the fecundity of birds. [11] But men are not birds, and have not acted like them for millenniums, at least.

*If* each human family were dependent only on its own resources; *if* the children of improvident parents starved to death; *if* thus, over breeding brought its own "punishment" to the germ line -- *then* there would be no public interest in controlling the breeding of families. But our society is deeply committed to the welfare state, [12] and hence is confronted with another aspect of the tragedy of the commons.

In a welfare state, how shall we deal with the family, the religion, the race, or the class (or indeed any distinguishable and cohesive group) that adopts over breeding as a policy to secure its own aggrandizement? [13] To couple the concept of freedom to breed with the belief that everyone born has an equal right to the commons is to lock the world into a tragic course of action.

Unfortunately this is just the course of action that is being pursued by the United Nations. In late 1967, some thirty nations agreed to the following: "The Universal Declaration of Human Rights describes the family as the natural and fundamental unit of society. It follows that any choice and decision with regard to the size of the family must irrevocably rest with the family itself, and cannot be made by anyone else." [14]

It is painful to have to deny categorically the validity of this right; denying it, one feels as uncomfortable as a resident of Salem, Massachusetts, who denied the reality of witches in the seventeenth century. At the present time, in liberal quarters, something like a taboo acts to inhibit criticism of the United Nations. There is a feeling that the United Nations is "our last and best hope," that we shouldn't find fault with it; we shouldn't play into the hands of the archconservatives. However, let us not forget what Robert Louis Stevenson said: "The truth that is suppressed by friends is the readiest weapon of the enemy." If we love the truth we must openly deny the validity of the Universal Declaration of Human Rights, even though it is promoted by the United Nations. We should also join with Kingsley Davis [15] in attempting to get Planned Parenthood-World Population to see the error of its ways in embracing the same tragic ideal.

## Conscience Is Self-Eliminating

It is a mistake to think that we can control the breeding of mankind in the long run by an appeal to conscience. Charles Galton Darwin made this point when he spoke on the centennial of the publication of his grandfather's great book. The argument is straightforward and Darwinian.

People vary. Confronted with appeals to limit breeding, some people will undoubtedly respond to

the plea more than others. Those who have more children will produce a larger fraction of the next generation than those with more susceptible consciences. The differences will be accentuated, generation by generation.

In C. G. Darwin's words: "It may well be that it would take hundreds of generations for the progenitive instinct to develop in this way, but if it should do so, nature would have taken her revenge, and the variety *Homo contraciens* would become extinct and would be replaced by the variety *Homo progenitivus*. [16]

The argument assumes that conscience or the desire for children (no matter which) is hereditary-but hereditary only in the most general formal sense. The result will be the same whether the attitude is transmitted through germ cells, or exosomatically, to use A. J. Lotka's term. (If one denies the latter possibility as well as the former, then what's the point of education?) The argument has here been stated in the context of the population problem, but it applies equally well to any instance in which society appeals to an individual exploiting a commons to restrain himself for the general good -- by means of his conscience. To make such an appeal is to set up a selective system that works toward the elimination of conscience from the race.

## **Pathogenic Effects of Conscience**

The long-term disadvantage of an appeal to conscience should be enough to condemn it; but it has serious short-term disadvantages as well. If we ask a man who is exploiting a commons to desist "in the name of conscience," what are we saying to him? What does he hear? -- not only at the moment but also in the wee small hours of the night when, half asleep, he remembers not merely the words we used but also the nonverbal communication cues we gave him unawares? Sooner or later, consciously or subconsciously, he senses that he has received two communications, and that they are contradictory: 1. (intended communication) "If you don't do as we ask, we will openly condemn you for not acting like a responsible citizen"; 2. (the unintended communication) "If you *do* behave as we ask, we will secretly condemn you for a simpleton who can be shamed into standing aside while the rest of us exploit the commons."

Every man then is caught in what Bateson has called a "double bind." Bateson and his co-workers have made a plausible case for viewing the double bind as an important causative factor in the genesis of schizophrenia. [17] The double bind may not always be so damaging, but it always endangers the mental health of anyone to whom it is applied. "A bad conscience," said Nietzsche, "is a kind of illness."

To conjure up a conscience in others is tempting to anyone who wishes to extend his control beyond the legal limits. Leaders at the highest level succumb to this temptation. Has any president during the past generation failed to call on labor unions to moderate voluntarily their demands for higher wages, or to steel companies to honor voluntary guidelines on prices? I can recall none. The rhetoric used on such occasions is designed to produce feelings of guilt in noncooperators.

For centuries it was assumed without proof that guilt was a valuable, perhaps even an indispensable, ingredient of the civilized life. Now, in this post-Freudian world, we doubt it.

Paul Goodman speaks from the modern point of view when he says: "No good has ever come from feeling guilty, neither intelligence, policy, nor compassion. The guilty do not pay attention to the object but only to themselves, and not even to their own interests, which might make sense, but to their anxieties." [18]

One does not have to be a professional psychiatrist to see the consequences of anxiety. We in the Western world are just emerging from a dreadful two centuries-long Dark Ages of Eros that was sustained partly by prohibition laws, but perhaps more effectively by the anxiety-generating mechanisms of education. Alex Comfort has told the story well in *The Anxiety Makers*; [19] it is not a pretty one.

Since proof is difficult, we may even concede that the results of anxiety may sometimes, from certain points of view, be desirable. The larger question we should ask is whether, as a matter of policy, we should ever encourage the use of a technique the tendency (if not the intention) of which is psychologically pathogenic. We hear much talk these days of responsible parenthood; the coupled words are incorporated into the titles of some organizations devoted to birth control. Some people have proposed massive propaganda campaigns to instill responsibility into the nation's (or the world's) breeders. But what is the meaning of the word conscience? When we use the word responsibility in the absence of substantial sanctions are we not trying to browbeat a free man in a commons into acting against his own interest? Responsibility is a verbal counterfeit for a substantial quid pro quo. It is an attempt to get something for nothing.

If the word responsibility is to be used at all, I suggest that it be in the sense Charles Frankel uses it. [20] "Responsibility," says this philosopher, "is the product of definite social arrangements." Notice that Frankel calls for social arrangements -- not propaganda.

## **Mutual Coercion Mutually Agreed Upon**

The social arrangements that produce responsibility are arrangements that create coercion, of some sort. Consider bank robbing. The man who takes money from a bank acts as if the bank were a commons. How do we prevent such action? Certainly not by trying to control his behavior solely by a verbal appeal to his sense of responsibility. Rather than rely on propaganda we follow Frankel's lead and insist that a bank is not a commons; we seek the definite social arrangements that will keep it from becoming a commons. That we thereby infringe on the freedom of would-be robbers we neither deny nor regret.

The morality of bank robbing is particularly easy to understand because we accept complete prohibition of this activity. We are willing to say "Thou shalt not rob banks," without providing for exceptions. But temperance also can be created by coercion. Taxing is a good coercive device. To keep downtown shoppers temperate in their use of parking space we introduce parking meters for short periods, and traffic fines for longer ones. We need not actually forbid a citizen to park as long as he wants to; we need merely make it increasingly expensive for him to do so. Not prohibition, but carefully biased options are what we offer him. A Madison Avenue man might call this persuasion; I prefer the greater candor of the word coercion.

Coercion is a dirty word to most liberals now, but it need not forever be so. As with the four-

letter words, its dirtiness can be cleansed away by exposure to the light, by saying it over and over without apology or embarrassment. To many, the word coercion implies arbitrary decisions of distant and irresponsible bureaucrats; but this is not a necessary part of its meaning. The only kind of coercion I recommend is mutual coercion, mutually agreed upon by the majority of the people affected.

To say that we mutually agree to coercion is not to say that we are required to enjoy it, or even to pretend we enjoy it. Who enjoys taxes? We all grumble about them. But we accept compulsory taxes because we recognize that voluntary taxes would favor the conscienceless. We institute and (grumblingly) support taxes and other coercive devices to escape the horror of the commons.

An alternative to the commons need not be perfectly just to be preferable. With real estate and other material goods, the alternative we have chosen is the institution of private property coupled with legal inheritance. Is this system perfectly just? As a genetically trained biologist I deny that it is. It seems to me that, if there are to be differences in individual inheritance, legal possession should be perfectly correlated with biological inheritance—that those who are biologically more fit to be the custodians of property and power should legally inherit more. But genetic recombination continually makes a mockery of the doctrine of "like father, like son" implicit in our laws of legal inheritance. An idiot can inherit millions, and a trust fund can keep his estate intact. We must admit that our legal system of private property plus inheritance is unjust -- but we put up with it because we are not convinced, at the moment, that anyone has invented a better system. The alternative of the commons is too horrifying to contemplate. Injustice is preferable to total ruin.

It is one of the peculiarities of the warfare between reform and the status quo that it is thoughtlessly governed by a double standard. Whenever a reform measure is proposed it is often defeated when its opponents triumphantly discover a flaw in it. As Kingsley Davis has pointed out, [21] worshipers of the status quo sometimes imply that no reform is possible without unanimous agreement, an implication contrary to historical fact. As nearly as I can make out, automatic rejection of proposed reforms is based on one of two unconscious assumptions: (1) that the status quo is perfect; or (2) that the choice we face is between reform and no action; if the proposed reform is imperfect, we presumably should take no action at all, while we wait for a perfect proposal.

But we can never do nothing. That which we have done for thousands of years is also action. It also produces evils. Once we are aware that the status quo is action, we can then compare its discoverable advantages and disadvantages with the predicted advantages and disadvantages of the proposed reform, discounting as best we can for our lack of experience. On the basis of such a comparison, we can make a rational decision which will not involve the unworkable assumption that only perfect systems are tolerable.

## **Recognition of Necessity**

Perhaps the simplest summary of this analysis of man's population problems is this: the commons, if justifiable at all, is justifiable only under conditions of low-population density. As the human population has increased, the commons has had to be abandoned in one aspect after another.

First we abandoned the commons in food gathering, enclosing farm land and restricting pastures and hunting and fishing areas. These restrictions are still not complete throughout the world.

Somewhat later we saw that the commons as a place for waste disposal would also have to be abandoned. Restrictions on the disposal of domestic sewage are widely accepted in the Western world; we are still struggling to close the commons to pollution by automobiles, factories, insecticide sprayers, fertilizing operations, and atomic energy installations.

In a still more embryonic state is our recognition of the evils of the commons in matters of pleasure. There is almost no restriction on the propagation of sound waves in the public medium. The shopping public is assaulted with mindless music, without its consent. Our government has paid out billions of dollars to create a supersonic transport which would disturb 50,000 people for every one person whisked from coast to coast 3 hours faster. Advertisers muddy the airwaves of radio and television and pollute the view of travelers. We are a long way from outlawing the commons in matters of pleasure. Is this because our Puritan inheritance makes us view pleasure as something of a sin, and pain (that is, the pollution of advertising) as the sign of virtue?

Every new enclosure of the commons involves the infringement of somebody's personal liberty. Infringements made in the distant past are accepted because no contemporary complains of a loss. It is the newly proposed infringements that we vigorously oppose; cries of "rights" and "freedom" fill the air. But what does "freedom" mean? When men mutually agreed to pass laws against robbing, mankind became more free, not less so. Individuals locked into the logic of the commons are free only to bring on universal ruin; once they see the necessity of mutual coercion, they become free to pursue other goals. I believe it was Hegel who said, "Freedom is the recognition of necessity."

The most important aspect of necessity that we must now recognize, is the necessity of abandoning the commons in breeding. No technical solution can rescue us from the misery of overpopulation. Freedom to breed will bring ruin to all. At the moment, to avoid hard decisions many of us are tempted to propagandize for conscience and responsible parenthood. The temptation must be resisted, because an appeal to independently acting consciences selects for the disappearance of all conscience in the long run, and an increase in anxiety in the short.

The only way we can preserve and nurture other and more precious freedoms is by relinquishing the freedom to breed, and that very soon. "Freedom is the recognition of necessity" -- and it is the role of education to reveal to all the necessity of abandoning the freedom to breed. Only so, can we put an end to this aspect of the tragedy of the commons.