International Congress of Genetics August 20, 1973

Genetics and Society:

Stent --> Genetics as ideology, theology, policy.
Integrity of science.

I have swum in that merky pool now.

Social impact on research workers too evident. No doubt of social frame in funding; contests about legitmacy of research battered from right to left.

Internal Process. Genetics as a discipline. As A SCIENCE. Our own community. What makes us tick. Zimain - social knowledge defines the frontier of genetics -- each of us applies his personal creativity to answering these.

1. In my own work, fair amount of time in AI, the modelling of scientific thinking as a mechanized process: hypothesis formation, induction and verification in computer programs.

2. Institutional aspects: departments. NAS, NIGMS.

3. Solution of central problem - autonomy of gene used to support the definition of the discipline now uncertain. Mutation. Like the irrational numbers to Pythagoras.

   Political control of science based on a misunderstanding of mutation and over-idealization of the gene -->Haldane Lysenkoist horror in the USSR. Vernalize people rather than eugenicize them.

3a. Vignette of how it happened in the 40's. Stent's lumping of Mendel and Avery - need to reassess some distinction: sharp contrast. There were disciplinary problems -- the success of bacteriology delayed recombination at least 40 years. Need convergence of population/developomental genetics with bacteriology.

4. What's left for us as a discipline:
   The disunity of genetics is its central asset.
   Tension bewteen biometrical-evolutionary and developmental approaches and interpentration of other disciplines.

   Lots of problems since all their dirty linen falls on geneticist's heads.

   Don't want to encourage messianism but scientists have been able to frame clear questions.

   Dangers and opportunities:
   1. Our own rigidification
      -- to other natural sciences
      -- discover other levels of connection with ethics and politics --- many unsolved problems

   2. Taking genetics too seriously.
      -- on the biochemical side - OK. No fears there re: impact of reorganizations of discipline but degree of success is closing mind to new ideas
      -- people call themselves geneticists can work on immunology or ..... whatever
      -- on biomedical side - methods are still too crude, but the

convergence of genetic analysis with demography, epidemiology, educational psychology etc is still at a primitive stage. Criticism by geneticists of traditional dogmas in these should not have to depend on whether this is high or low heritability, but an exploration of what this means.

Political problems! Confusion about knowledge and its abuse causes

Duncans (?) illustrate the use of genetic-analytic methodology while carefully avoiding biological hereditary factors themselves. E.G. the measure to which blackness per se is a discriminating factor even whether IQ and all other family factors are discounted!

Other epidemiological work needed to understand the sources of health in the way that we know something about agricultural productivity. Provoked by efforts to measure the hazards of radiation -- the trade offs between diagnostic xrays and genetic disease (keeping in mind that mutation is used as a scare for everthing from nuclear power to LSD).

Developing new methodologies.

NEED to seek out more applications and rebuild its roots.
- -- genetic disease/many ethical problems to finding the maximum good
- -- agriculture/need new interdisciplinary approaches
- -- world health/life cycle of the schistosome as a challenge to human welfare

Medawar & Popper - the difficulties of achieving consensus on major social goals

Political more than scientific challenges can reach the point of destroying science.

Piecemeal social engineering - solve one problem at a time. There are plenty of them which excite only a little political conflict, allow time for adjustments of culture and of the sciences to the public will and in the aggregate more iconoclastic. It is not my assigned job to introduce the next speakers but I have consciously set the stage for them.

Sir Otto may not look like a revolutionary, but there is little doubt that he and his colleagues profoundly are transforming the modern world.

Connect technopathy footnote re: scientifc optimistic. From a radical perspective, technological optimism diverts both the intelligentsia and the masses from attending the drastic changes in the social system believed to be indispensable for any real progress. It is easy to find examples of naive unwarranted claims for technical panaceas which provide ammunition for attack from the political quarter.

Footnote: Berlin on Machiavelli. Inconsistency of Western Ethics. City of God not possible on earth. "self-contradictory"

Is Genetics a Science?

Hard not to talk nonsense at such a session; I may be no exception.

What did I have in mind? Well I was so busy, weary and discouraged about training grants and everything else that now displaces the gene from a geneticist's preoccupations, I had to leave room for an open-ended discussion to be repaired in that infinity of time between then and now. That has to do with offering the title and now delivering.

IGAS: yes and furthermore
no; but... nevertheless...

Well now here it is -- several trips to Washington later, but not much less discouraged about the fiscal base -- what did I have in mind.

One part - Genetics not as science but as a counter-religion as ideology and its politics. Gunther has taken for his topic. If there is more time and less wisdom I might get back to that. Obviously the closer genetics comes to deep seated theological and political issues, the harder it is to retain its integrity as a science. These are deep seated urges and it is not easy to keep your balance in sorting out our responsibilities as scientists. Dr. Stent has talked about that.

Other part - I have to keep in mind that there is a session on genetics and Society. But after having done at least my share to expose ....

Aspirations to be in the counsels of high and mighty. Science has taken on several roles besides the understanding of nature.

But by taking a stand on unanswerable questions invited grave threats to its own integrity. For awhile the quest for reliance is exciting, socially reinforced, may attract better funding. In the long run -- just another branch of politics with demagogery taking the place of openmindedness and the appeal to the experiment as the arbiter.

What are some unanswerable questions?

When does life begin and end.

Is a good additive absolutely safe?

Touchstone of procedure and verification by relevant dialogue. Experiment or theory.

Publication: exposure of arguments.
discipline of allusion to precedents
1. answer them
2. document other answers
*3. ignore them
channel for rebuttal

Peer Review --> next approximation

Expert Committees:
contra - demonstrations
- petitions
- public debates
- press
- this lecture

all of these things have their place. Most of us are educators as well as scientists. But these are not means of answering scientific questions. They may even get in the way.

Limit to the amount of public autonomy as science can stand*.

*One reason to favor the reorganization of NAS.

Example - the expert committee
Well meaning effort to short circuit the scientific dialetic.
Well meaning does always mean honest or reliable.

1. It can review the literature and summarize present state of controversy.
Staff can do the primary job of assembling the text and readable language.

Diverse points of view assure "reasonable emphasis".

2. More problematical.
Given explicit policy axioms, what are the consequences.

3. Most often. Invent the value axioms and write a prescription which is a hodgepodge of value orientation, multifarious personal conflicts of interest, and the information of 1.

And just as some people make a living by searching for new knowledge and others by exploiting it for a given client, there are those whose bread and butter depends on generating the most public notoriety that can be extracted from a given situation. So no one is free from a conflict of interest -- your own judgment as to which is most morally reprehensible.

The policy side of genetic issues and bringing them to public attention. I have come to reflect more on our own community of scientists, what makes us tick, how we can keep our integrity by our own standards of respect for new discovery of ways of looking at nature. Social definition of frontier of knowledge questions individual creativity mainly in answering microscopic pieces. So I'm thinking now of the process of science itself, of our own community or communities of geneticists.

So Part 2 might be - Is Genetics A Science, or has it outlived its usefulness as a discipline and if so what will take its place.

Introspection about science as approach to augmenting the spark of human creativity with thinking on computer programs.

One reason for my preoccupation with this issue is the peculiar and changing nature of genetics as a discipline.

There are not many departments of genetics in this country, and still it fell to me to found two of them in the medical school at Wisconsin and at Stanford, and these were experiments of intellectual organization that needed justification when they were started, and ought to be scrutinized all along. But I am sure the majority of members of this Congress belong to a wider variety of departments, and more than most other groups -- except perhaps biophysics -- there are special problems about where we belong. Conversely -- perhaps because of this problematical acceptability -- we tend to be a bit messianic. Certainly before the biochemists and the pediatricians we had a message that set us off. Even before Niremberg and Ochoa, there was a kind of genetic code: the mystery of the Mendelian ratio.

Just last week while I was preparing these notes I had a letter from Cliff Grobstein reporting that an Academy Committee was looking at the organization of biology and deciding that the shortlived section on genetics might well be carved up in a redistribution along lines of levels of emergence (but somehow they couldn't put molecular biology and biochemistry into the same group). So this same question is popping up elsewhere in academia.

On the other hand, there is some feeling that NIGMS should become the NI of G & MS. Which is rather an empty blessing.... but perhaps eventually a GOOD THING. Except of course richer institutes like cancer & heart must not also forget the genetic factor in those categories (which institute could leave us out?)

So many people are worrying about these issues in a tangible way that may well affect our livelihood? peers? (pens) and our intellectual companionship, and how to get the means to do our work.

One source of concern about a successful discipline -- and by god genetics is a science! is whether it does not become too rigid and rejecting of new ideas.

My own work in 1945/6... seemed to me to be a remarkably post mature delivery. Why wasn't recombination in bacteria discovered in 1905?

I know more about why it did happen just then, and since this is a countermyth to one that another bard has been singing more lyrically I should spell out the details which have not been published. And take a little more faith than I have that the story is indispensable to my main point.

In 1945 I was a first year medical student at Columbia under Ryan's influence. He had just come back from a sabbatical with Beadle and Tatum in Neurospora, biochemical genetics... . Interested in temperature effects/growth. WAR needs -- amino acid assays on food stuffs etc.

The department was abuzz with Avery's work on pneumococcus. Several seminars. No one really understood what it could mean -- innumberable hypotheses and some questions about purity of DNA.

In 1945 a general perception that this might be a turning point in biology. Hard to imagine a situation that could contrast more sharply with the deprecation of Mendel by his contemporaries who did know about it, and the non communication to the rest of the community. For example, Medawar in a review that year compared the pneumococcal transformation to an infective transformation of pigment cells he thought he encountered in his skin graft experiments -- that later were to culimate in the discovery of prenatally induced tolerance).

But what could biologists do about it?

1. The chemical controversy had to be cleared up -- and it took about five years for Chargaff and Hotchkiss to do this.
   -- base ratios
   -- clean DNA

So by 1952 no one had reason to question Hershey & Chase and of course by 1953 Watson & Crick had worked out the structure.

But back to Columbia - on the biological side it seemed as if there were only two things to do.

1. transform a "eukaryote" (Neurospora failed)
2. classicize bacterial crossing
   a. markers like Neurospora but no crosses

Boivin glitch.

Why not before?

1908 - Browning?

No serious interest in experiments with clear cut markers using the

selective approach.

Needed a unification of bacteriology/biochemical markers/population genetics

Eash discipline was too successful.

Beadle has recounted he did not rediscover Garrod's work till long after their successes with Neurospora!

What are we missing today.

Disciplinary state of genetics.

AUTONOMY OF THE GENE - gone with discovery of its material basis.

Hang loose! we are not a unified discipline. In fact our role is not to be a bridge but just the cement that holds other sciences together. If we can maintain a high level of disciplinary tension, genetics may continue to be the center of ever more exciting discovery.

Caution -- the bacteriologists and virologists of the 1920's were also remarkably successful and had missed the main point of biology.

So it seems to me that the apparent diversity of genetics is its greatest asset. The molecular developmental and evolutionary sides need to keep pushing at one another. The greatest mistakes come from looking at a problem too narrowly - which may happen out of assymetric development of the tools. Research on intelligence only from a biometric standpoint can lead only to futility and bitter conflict. As clues for understanding the brain it will lead to new completely new insights that will have no resemblance to the silly battles over silly questions that are consuming so much energy today.

Genetics is too successful to make it easy to identify the opportunities it is missing today. It took a blow on the head like Avery's to redirect genetics in the 40's.

Back to social utility.

Genetic disease. Rare - SICKLE. Still only 1/400 obvious but limited range. Common diseases - need to know: schizophrenia.
Education - far more difficult than polygenic diseases.

Have forgotton about agricultural.

Apply molecular genetics to new crops: better protein values
occupy new niches
restore ravaged soils

malaria - still world's major public health problem
shistosome

fascinating life cycles

primitive knowledge of genetics

I have another note dated 4/20 probably in preparation

Is Genetics a Science

Get Gene's (Garfield) help - statistics of journal impact

Who are members of NAS and their fields.
Interconnections and conceptual assumptions of such disciplines.

Does it matter that gene = DNA?

Haldane/Lysenko

Gene as autonomous entity revealed indirectly

the analog is high energy physics/chemistry

Place in taxonomies of science: NAS
NSF
NIH study section
departments

Politics of geneticists/Lysenko off shoots

Haldane/Modern Quarterly article

other data sources: Library of Congress; Dewey? EB Wilson - how classify

as witchcraft - genetic engineering. Utopian genetics/therapeutics

Does it matter? Role of disciplines

Answer Stent on Avery//Ask for data

Refer to NY Times article/Robt Reinhold on 8/27 that only one Nobel Prize winner showed up and I came "for only one morning".

Notes from Intl Congress dogmas

48 chromosomes

Hard not to talk nonsense at this kind of program. I can't guarantee to be vastly superior to my colleagues on this occasion.

Mutability - and irrational numbers for the Pythogoreans.

Proorbis: dangerous knowledge
The theme was taken up again in the story of Galileo --in Brecht's play we can see how the Marxist sympathizes with the need for the church to retain its authority, for what it regarded as the social welfare -- a good that justified the burning of Bruno in 1600. But the earth does turn... .

An artificial ensemble of a branch of biochemistry with a branch of demography, salted with some obstetrics and pediatrics, and peppered with eugenic politics.

The other speakers on this symposium were James V. Neel, Sir Otto Frankel from Canberra and Gunther Stent who talked about Soul and Science, the Dilemma of Applied Human Genetics. I don't know if he has published that. I should look up and see if there were proceedings of any kind published in that Congress.